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ORIGINAL

PROVISIONAL SPECIFICATION FOR AN INVENTION ENTITLED:

Invention Title: Escape Device

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The invention is described in the following statement:

Escape Device

FIELD OF THE INVENTION

The present invention relates to an escape device. The device of the present invention is directed to a device that enables escape from high-rise buildings.

BACKGROUND OF THE INVENTION

In emergencies evacuation from multi-story buildings is problematic. Specifically where a situation, for example a fire, occurs in a lower floor people on upper floors can be trapped. In such situations use of elevators is generally not recommended and, where interruptions to power supply occur, is not possible. Many modern buildings are constructed so as to include fireproof floors at some levels. However, public confidence in the ability of fire proofing systems is not high. Further, it has become apparent that there are emergency situations that may arise as a result of deliberate sabotage in which the structural integrity of the building is compromised. In such situations fast escape from the building may be required for large numbers of personnel in a short space of time to avoid injury and fatality on a large scale as a building collapses.

Some prior art devices for escape from buildings are known.

In some buildings the exterior of the building may be designed or modified to incorporate exterior escape routes or emergency evacuation equipment. This approach is not suitable for use in very high buildings, nor is the approach suitable for the escape of the large numbers of people that may need to leave a building at any one time.

Portable escape devices are also known. Some of these devices have the advantage that any one individual may acquire and carry their own device for emergency situations. This obviously provides the individual with his or her own personal escape device, which is psychologically reassuring. However, these devices frequently operate on the basis of a friction brake with a simple on/off mechanism that causes jarring in use and, as such they are not suitable for traversing the distances needed to be travelled to reach ground level safely from many modern buildings. For example the

construction of the devices may be such that they would conceivably be very bulky if constructed for use in higher buildings, or the heat generated during their use would make them impractical. For this reason existing portable escape and descent devices are perhaps providing illusory reassurance to their owners.

It is to this situation that the present invention is addressed. A portable escape device is provided that allows the user to travel many floor levels.

SUMMARY OF THE INVENTION

Therefore, according to a first aspect of the invention although this need not be the broadest nor indeed the only aspect of the invention there is provided an escape device including: -

a cable;

-a reel on to which said cable is wound and from which said cable is dispensed under pressure,

-said reel being rotatably mounted within a housing, and said reel having associated there with a planetary gear arrangement including an output shaft operatively connected to a braking mechanism;

whereby a braking response of the braking mechanism is proportional to the rate at which cable is dispensed from the reel.

The device of the invention therefore uses the forces acting on the cable as it is paid out from the device to drive the gearing arrangement. The gearing arrangement then serves to accelerate to the speed of rotation such that the output from the gearing is then able to produce a substantial breaking effect.

In a preferred embodiment of the invention the braking mechanism is a centrifugal braking mechanism in which a brake spinner frame is connected to the output shaft and is rotated in response to rotation of the output shaft and wherein one or more braking elements may be pivotally mounted on the braking frame, said braking elements pivoting under the influence of centrifugal force as the output shaft rotates to thereby bring the braking elements progressively into contact with a braking surface, for example a brake drum. Thus, the area of the braking element in contact with the braking surface, and hence the braking response is increased as the speed of rotation of the braking frame is increased.

DESCRIPTION OF DRAWINGS

The above and other objects, features, and advantages of the present invention will be apparent from the following detailed description of a preferred embodiment in conjunction with the accompanying drawings. In the drawings:

Figure 1 illustrates an exterior view an escape device in accordance with the present invention;

Figure 2 illustrates an exterior view of a back plate to be used with the assembly of figure 1;

Figure 3 shows the of the main assembly of the device of figure 1;

Figure 4 shows a further view of the full assembly of the device;

Figure 5 depicts an exploded view of the main assembly;

Figure 6 shows the brake drum of the main assembly in various views;

Figure 7 shows the gear frame of the main assembly in various views;

Figure 8 shows the main frame of the main assembly in various views;

Figure 9 shows the back plate of the main assembly in various views;

Figure 10 illustrates output guides for use with the main assembly;

Figure 11 is an exploded view of the brake gear assembly;

Figure 12 is a view of the brake spinner and centre assembly;

Figure 13 depicts the brake and gear assembly in exploded view;

Figure 14 illustrates the exploded view of the brake assembly;

Figure 15 illustrates in detail the how the brake spring maintains contact with the brake drum with no rotation ;

Figure 16 illustrates in detail the brake pad holder in use;

Figure 17 shows the detail of the pivot pin in the brake pad holder;

Figure 18 illustrates a planetary gear arrangement and associated frame

Figure 19 illustrates in front and side view the spinner gear used in the gear arrangement

Figure 20 shows the spinner shaft associated with the spinner gear;

Figure 21 shows an assembly of the main and planetary frame;

Figure 22 depicts a detail of a planetary gear;

Figure 23 illustrates a detail of a shaft used in the planetary gears;

Figure 24 illustrates the cable wheel and associated decent cable in several views;

Figure 25 shows detail of a building attachment to be used in connection with the device of the present invention;

Figure 26 illustrates the channel used in figure 25; and

Figure 27 illustrates an alternative braking arrangement.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The drawings illustrate the various components of an escape device 10 constructed in accordance with the present invention. The device 10 is designed for rapid deployment and may be used to evacuate large numbers of personnel from modern multi-story buildings in a short space of time. As will be described, the device 10 is designed to be used in conjunction with a building attachment 12, shown in figures 25 and 26. In use it is anticipated that a unit 10 may be individually owned and carried from building to building as required by the owner, or, alternatively that a numbers of units 10 my be held in any one building for use by the occupants as and when the need arises.

The unit 10 can be seen in exterior view in figure 1. As seen the unit has a back plate 14 attached to which is a main assembly 16. Raised mounting points 17 are used to secure the main assembly 16 to the back plate 14. The back plate 16 is a snug fit to the back of a user. It is further apparent from an inspection of figures 1, 2 and 4 that the back plate 14 is moulded to take account of the contours of a body. A harness (not shown) is attached the back plate 16 through slots 18 and used to secure the unit 10 to the wearer.

The main assembly 16, and components therein, are constructed substantially of aluminium and thus the unit 10 is overall a lightweight structure.

Also visible from the exterior of the unit are the brake drum 20, main frame member 22, backing plate 24 and output guide 26. Taken together the brake drum 20, main frame member 22, and backing plate 24 form a housing for payout and braking mechanisms within the unit. As can be seen the housing elements are all generally circular and share common radial dimensions. Connecting screws, omitted from the drawings to allow greater clarity are arranged circumferentially around the elements and connect the elements together to form the overall housing structure.

The brake drum 20, as shown in figure 6 consists of an outer face 28. At the centre of the face 28, the material surface is deflected outwardly forming a small hump 30. An inspection of the interior of the drum 20 reveals an inner recess 32 adapted to receive a brake spinner shaft (to be described). Located circumferentially on the brake drum 20 is a plurality of spaced apart leaf members 36. The leaf members 36 serve to cool the device 10 in operation. Thus, as the device descends in use, airflow between adjacent leaf members 36 allows heat generated in the descent operation to dissipate from the device 10. No further cooling is regarded as necessary in the device. During operation the device 10 is thus self cooling and the as the speed of operation of the device increases, thereby increasing the speed of airflow across the drum 20 and the leaf members 36, the cooling effect thereof will proportionately increase.

The main frame 22 is essentially an open-ended cylinder. Importantly the wall of the main member 22 contains a slot 38 over which the output guide 26 is mounted. The output guide 26, illustrated in figure 10 is formed of two separate halves 26a, 26b that together form an inverted funnel having a central channel 27 leading out of the slot 30. During use of the device 10, cable 40 held in the device is dispensed through the slot 38 and travels through the channel 27 in the output guide 26. The channel 27 narrows to a neck 29 that forms the terminal guide for the cable 40. The cable 40 is a steel cable of sufficient breaking strength to hold any large adult as they travel under the influence of gravity though a distance of several hundred meters.

A reel 42 is used to hold and feed out the cable 40 during operation. As shown in figure 24 the reel has side flanges 45 and an inner wall 46 that together contain and house the cable 40. The reel 42 is sized to fit neatly within the main frame 22.

The interior surface of the wall 46 is notched and forms the ring gear of a planetary gear arrangement shown generally at 44. The planetary gear arrangement 44 is thus operatively connected to the cable feed out mechanism. In turn the planetary gear arrangement is associated with a braking mechanism indicated generally at 48. It should be noted that the reel 42, planetary gear arrangement 44 and braking mechanism 48 are all arranged co-axially and are interconnected through their common axis in a manner that ensures that the operation of the breaking mechanism operates in response to the speed of the cable feed out from the reel 42.

The planetary gear arrangement 44 is shown in detail in figures 5 and 13. Individual components of the arrangement are also illustrated separately in detail. The arrangement consists of three planetary gears 50, see figure 22, and a central spinner gear (the sun gear) 52, see figure 19. The spinner gear 52 engages all three planetary gears 50. Further the planetary gears 50 each engage the inner wall 46 of the reel 42 (the ring gear). The planetary gears 50 are carried on a gear frame 54 shown in figure 7. A respective planetary gear shaft 56 is used to attach each planetary gear 50 to the gear frame 54. The gear frame 54 is a generally circular plate with a central recess 56. This can be seen most clearly in side view. The arrangement of the spinner gear 52 and surrounding planetary gears 50 locate in the recess 56. The gear frame 54 is in use stationary and has an outermost rim 58 through which it is connected to the brake drum 20 and main frame 22.

The planetary gears 50 are driven in response to rotation of the reel 42 and in turn drive the spinner gear 52. It will be appreciated that the spinner gear 52 rotates at a multiple of the rotational speed of the reel 42, this being determined by the gearing ratio of the arrangement. In the embodiment under consideration the gear ratio is approximately 4:1.

The spinner gear 52 is located on a spinner gear shaft 60,shown in detail in figure 20. Interlocking elements on the spinner gear 52 and spinner gear shaft 60 secure the shaft for rotation with the gear 52. The spinner gear shaft 60 is also connected to a brake spinner frame 62.as shown in figure 12. The assembly of planetary gears 50, gear frame 54 and brake spinner 62 is shown to advantage in figure 11. The spinner gear shaft 60 thus forms the important connection from the reel 42, through the planetary gear arrangement 44 to the braking mechanism 48.

The brake mechanism 48 can be seen in figures 14-17 inclusive. The brake spinner frame 62 is a generally cruciform shaped plate having four arms 64 positioned at right-

angles to one another. The spinner gear shaft 60 passes through the of the brake spinner frame 62 and interlocks with the brake spinner frame 62 so that as the spinner gear shaft 60 rotates the brake spinner frame 62 also rotates. It can also be seen that the brake spinner frame 62 moves without hindrance in a space between the brake drum 20 and the gear frame 54.

The arrangement of the braking system is shown in figures 14 to 17. Positioned towards the outer edges of each arm 64 of the brake spinner frame 62 is a respective brake pad holder 66. The brake pad holders 66 are pivotally attached to the arms 64 through pivot pins 68. A brake pad 70 is secured onto outer surface of each brake pad holder 66. As can be seen the pivot pins 68 attach the brake pad holders 66 to the brake spinner frame 62 at one end thereof leaving one end 63 of the brake pad holder free. In the orientation shown in figures 15 and 16 the brake spinner frame 62 is rotated in a clockwise direction. Thus, the free end 63 of the brake pad holder forms leading edge as the brake spinner frame 62 rotates and the pivot pins 68 are adjacent a trailing edge of the brake pad holder 66.

The illustration of the brake arrangement shown in figures 15 and 16 is at rest, or in an unmoving position. Whilst at rest a spring 72 biases the brake pad holder 66 into position such that the trailing edge of the brake pad holder 70, adjacent the pivot pin 68, is biased against the inner surface of the brake drum 20 when there is no rotation of the brake spinner frame 62. The leading edge 63 of the brake pad holder 66 is left free, although, as can be seen from the detail of figure 16 the gap between the brake pad 70 and the brake drum 20 is in fact quite small. Because the trailing edge of the brake is in contact with the brake drum there is a small braking force at all times even when the device 10 is initialised and the speed of decent is very low. Thus, there is no requirement for the speed of the device to reach minimum speed before the braking mechanism will operate.

During operation the brake spinner frame 62 rotates at speed and the brake pad holders 66 are influenced by centrifugal forces. The brake pad holders 66 rotate about the pivot pins 68 thereby causing the curved outer surface of the brake pads 70 to progressively contact the surface of the brake drum 20. The brake therefore bites on the trailing edge first and then as the forces increase the whole of the brake pad 70 is brought into engagement with the brake drum 20; this action is facilitated by the relative positions of the pivot pins 68 and the point of contact of the brake pad 70 and the brake drum 20.

Thus, as the speed of the brake spinner frame 62 is increased, the centrifugal forces operating on the brake pad holders 66 is also increased, and the braking response, as a reflection of the contact are of the brake pad 70 to the brake drum 20, is also increased. Furthermore, it can also be understood that the braking response of the braking mechanism 48 is proportional to the rate at which cable 40 is dispensed from the reel 42.

In use therefore the device is assembled as described and as shown in the accompanying drawings. As seen in figure 1 the cable 40 terminates in a toggle 74. In extreme situations the toggle 74 may be attached to any convenient part of a building. However, in a preferred arrangement the building is modified to include a specific launch arm 76 as shown in figures 25 and 26. The launch arm 76 is typically mounted to the ceiling of each level of a building at secure points, mounting blocks 78 are provided for this purpose on either side of the launch arm 76.

The launch arm 76 consists of a hollow beam member having on its underside an open track 80 of the type used in many sliding door assemblies. The launch arm 76 may be positioned to project from the side-wall of the building, or, alternatively can be constructed to be in a retracted condition and movable to an extended position as required. A safety flap 82 restricts access to the track 80 until the launch arm 76 is in position for use.

The toggle 74 fits into the track 80 and is slideable along the track. It can be seen from figure 26 that the track 80 terminates in a curled ram's horn section 84. The ram's horn section allows a number of toggles and attached cables 40 to be retained thereon during use. This permits a maximum speed of operation.

Thus, in use, a device 10 is attached to the track 80 by inserting the toggle 74 into the track with the launch arm 76 in position. The device 10 is attached by harness to the back of an individual wearer. The wearer then escapes the building by descending on the cable 40. The reel 42 feeds out the cable as the person descends thereby inducing the planetary gear arrangement 44 to rotate. In turn, the planetary gear arrangement 44 accelerates the spinner gear 52 a multiple of the speed of the rotation of the planetary gear arrangement 44. The spinner gear 52 drives a corresponding rotation in the gear frame 54 and, under the influence of centrifugal forces the brakes pads 70 are brought to bear against the brake drum 20 thereby serving to moderate the speed of descent. At some point the decent will reach a steady state where the accelerating influence of

gravity and the braking effect are in equilibrium and the speed of decent becomes constant.

Figure 27 illustrates an alternative form of braking arrangement. In the drawing within the space created by the main frame 22 turbulence fins 90 move through a fluid medium to slow the descent speed. The main frame 22 is in this case sealed by means of a sealing plate 92 and the body of the mainframe filled with a sealing fluid for example air or oil.

The invention has been described by way of example. The examples are not, however, to be taken as limiting the scope of the invention in any way. Modifications and variations of the invention such as would be apparent to a skilled addressee are deemed to be within the scope of the invention.

Dated: 24 October 2002
Terry Victor Lee
By his Patent Attorneys
Lesicar Perrin

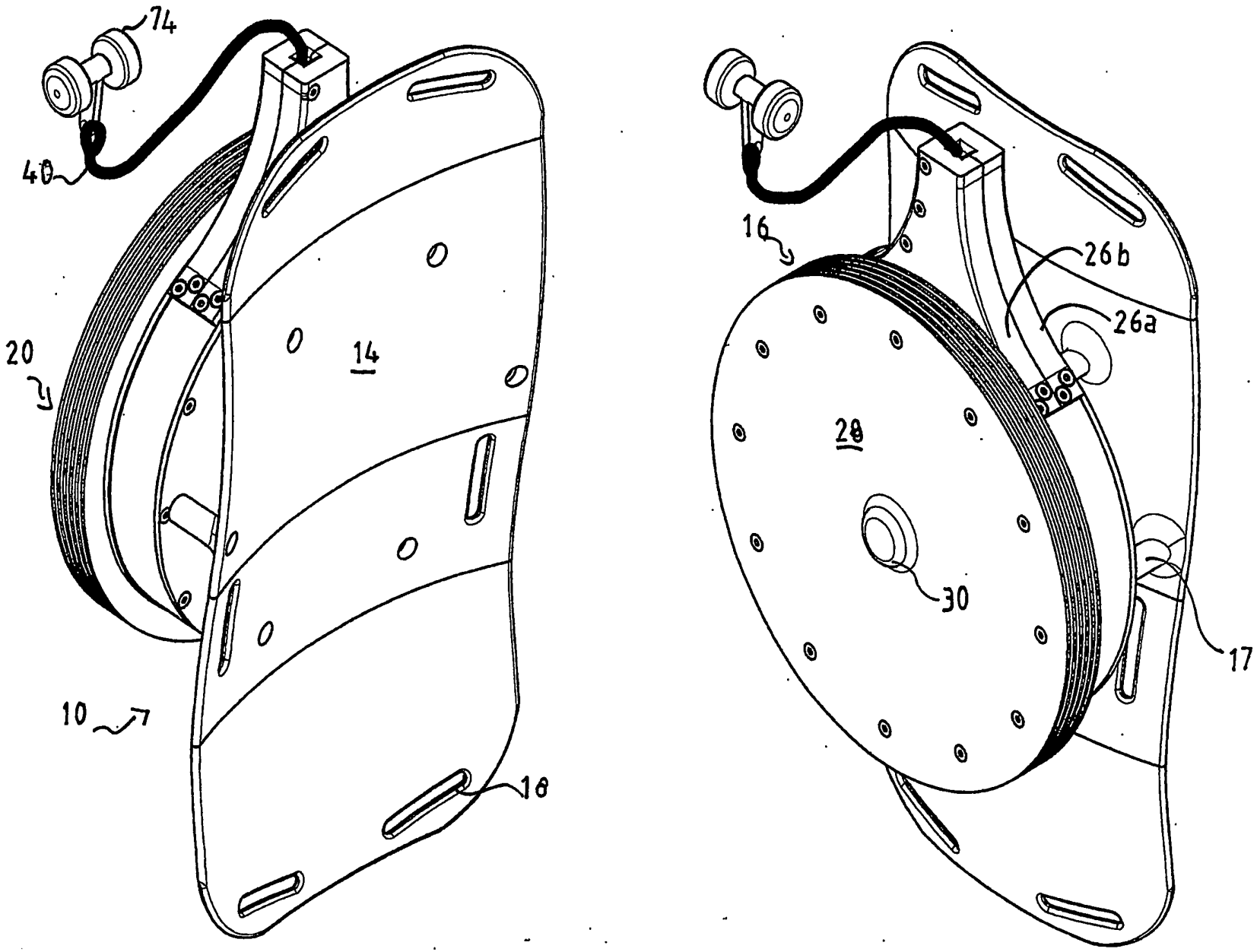


Fig 1

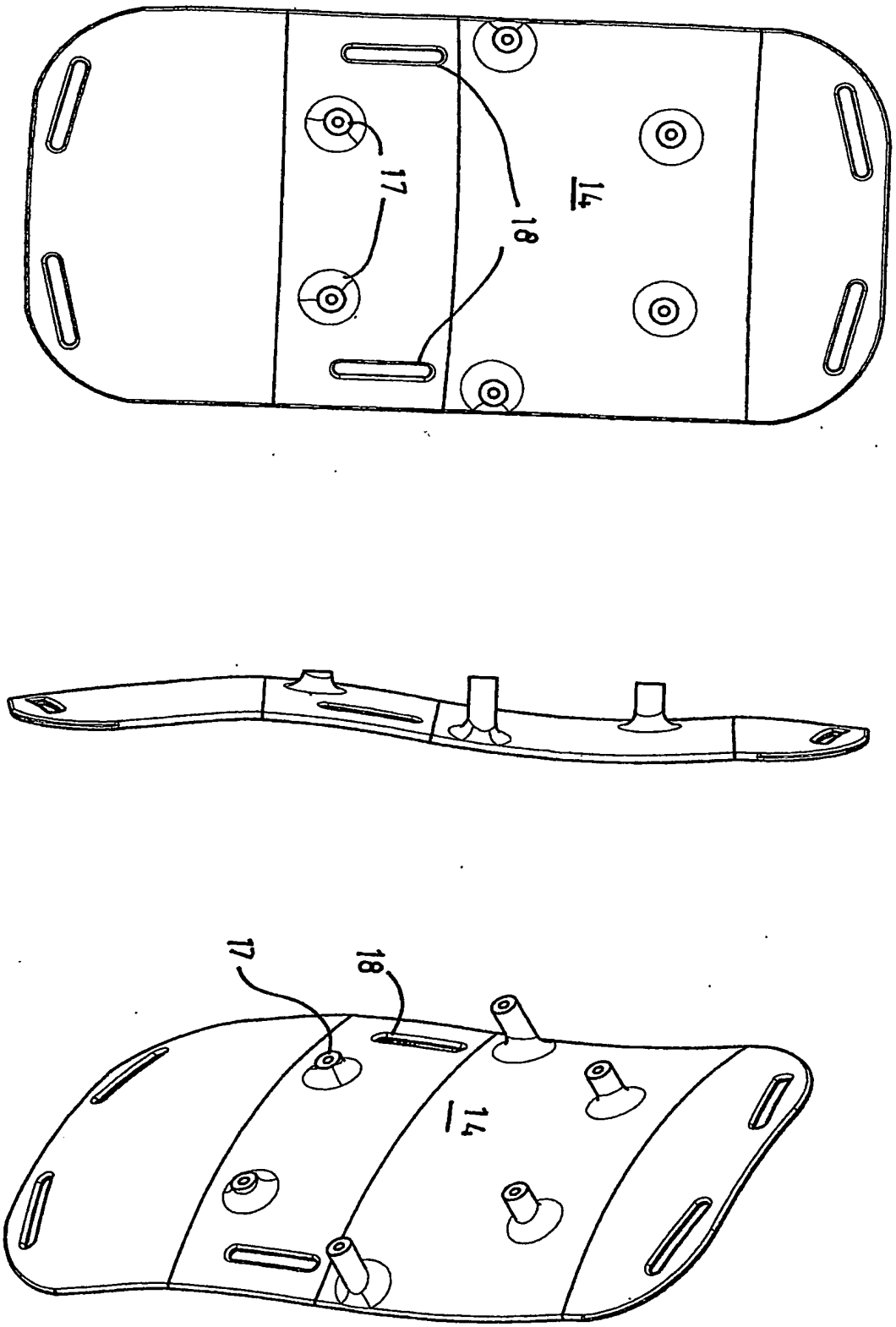
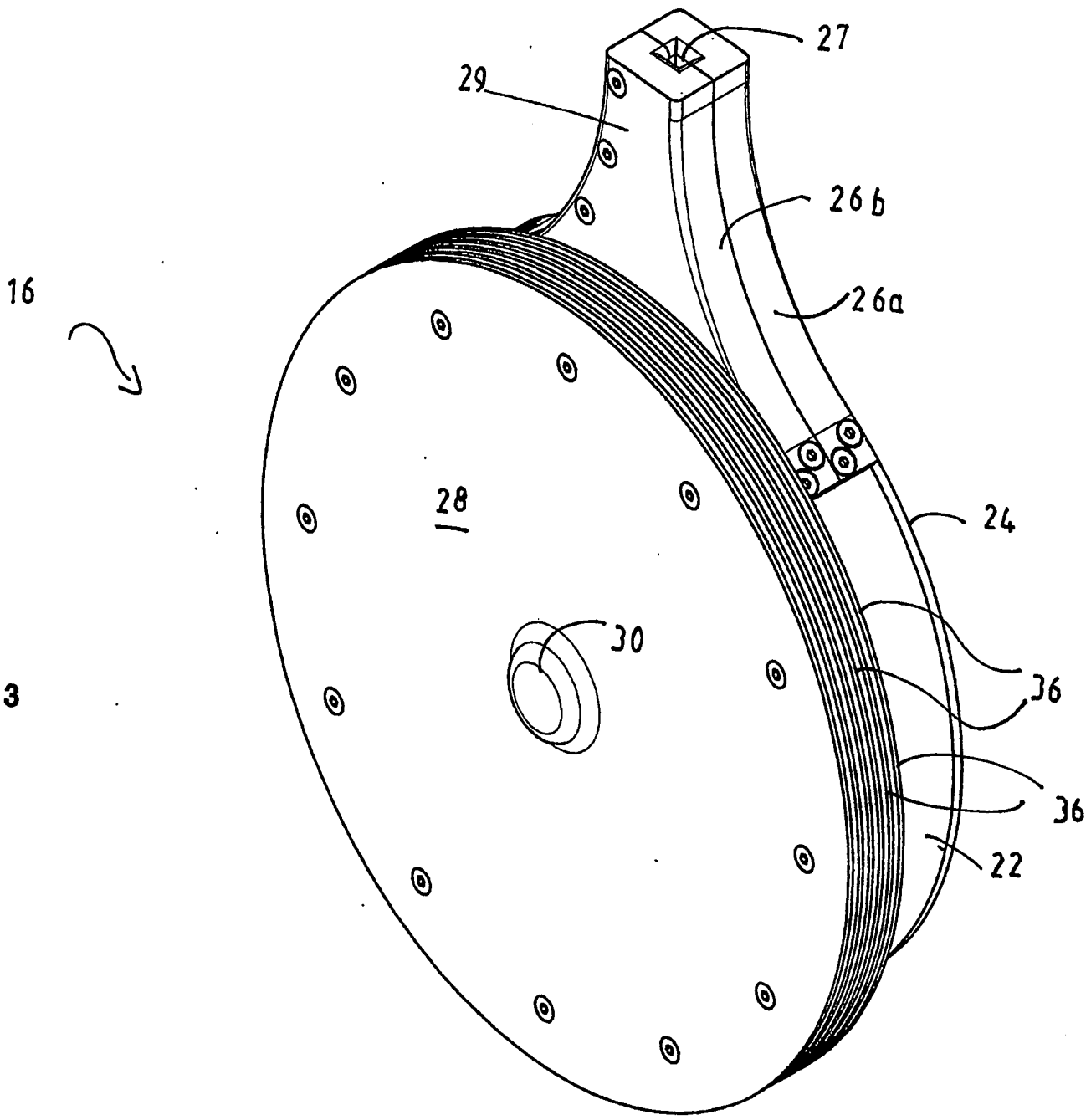


Fig 2



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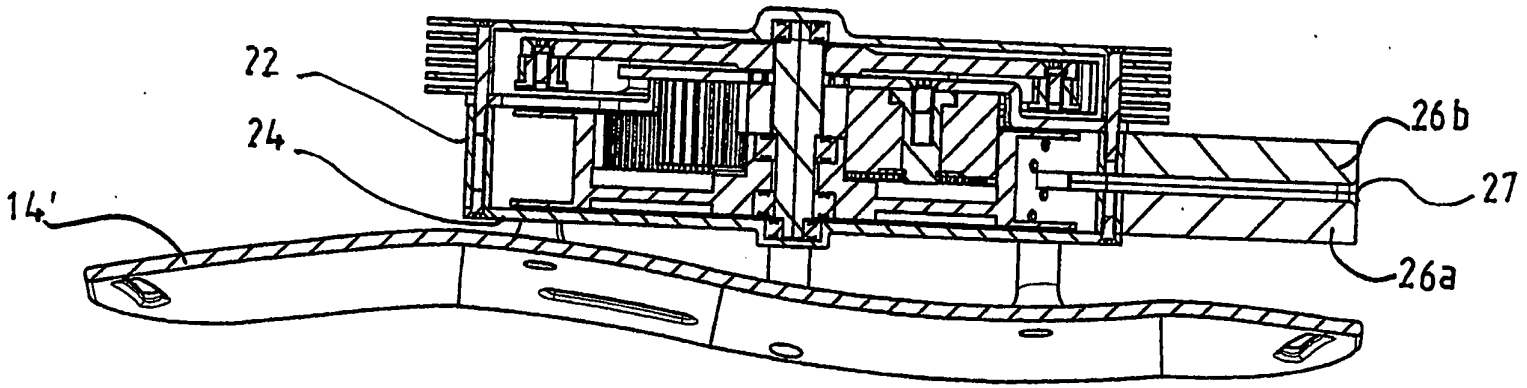
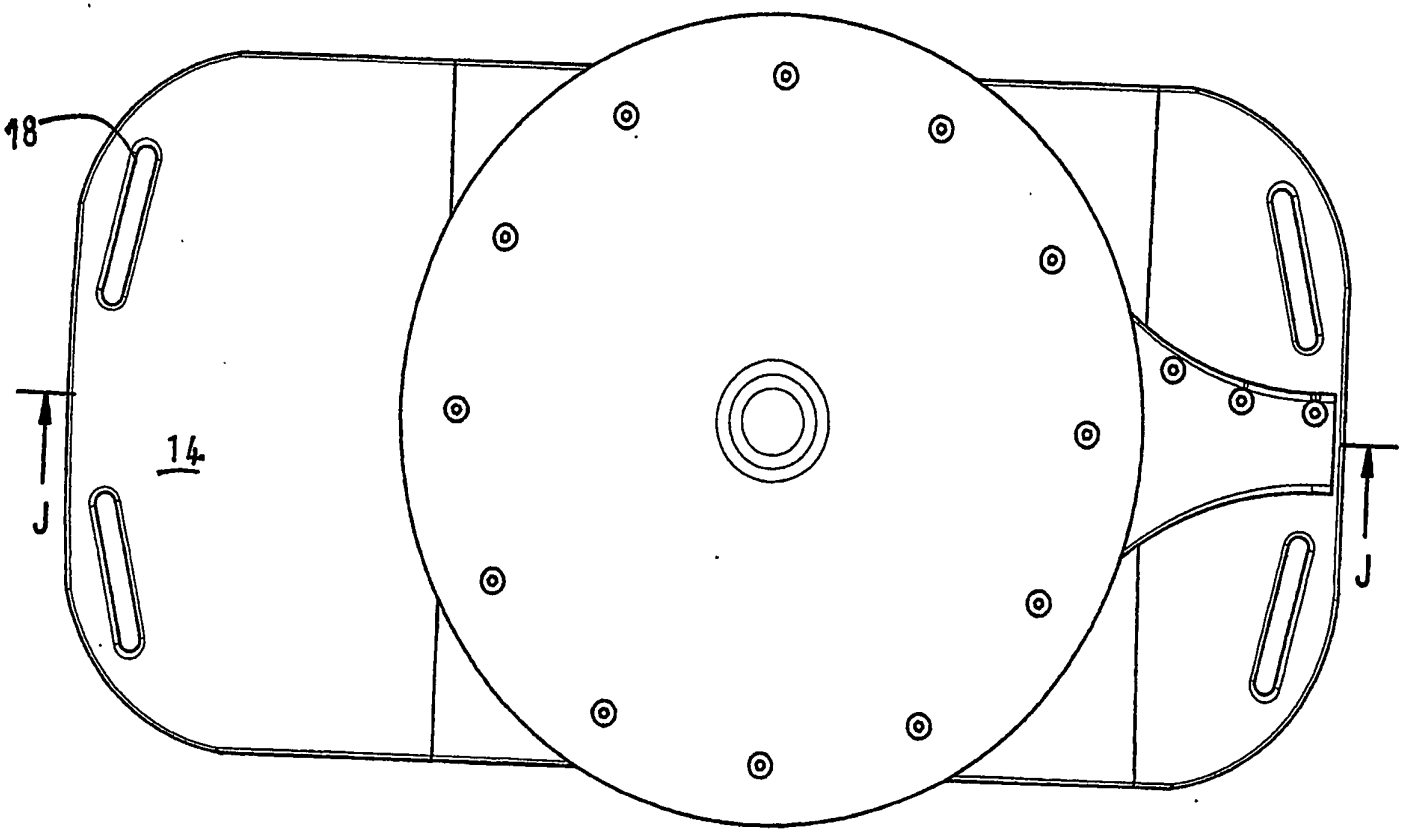


SECTION J-J

Fig 4



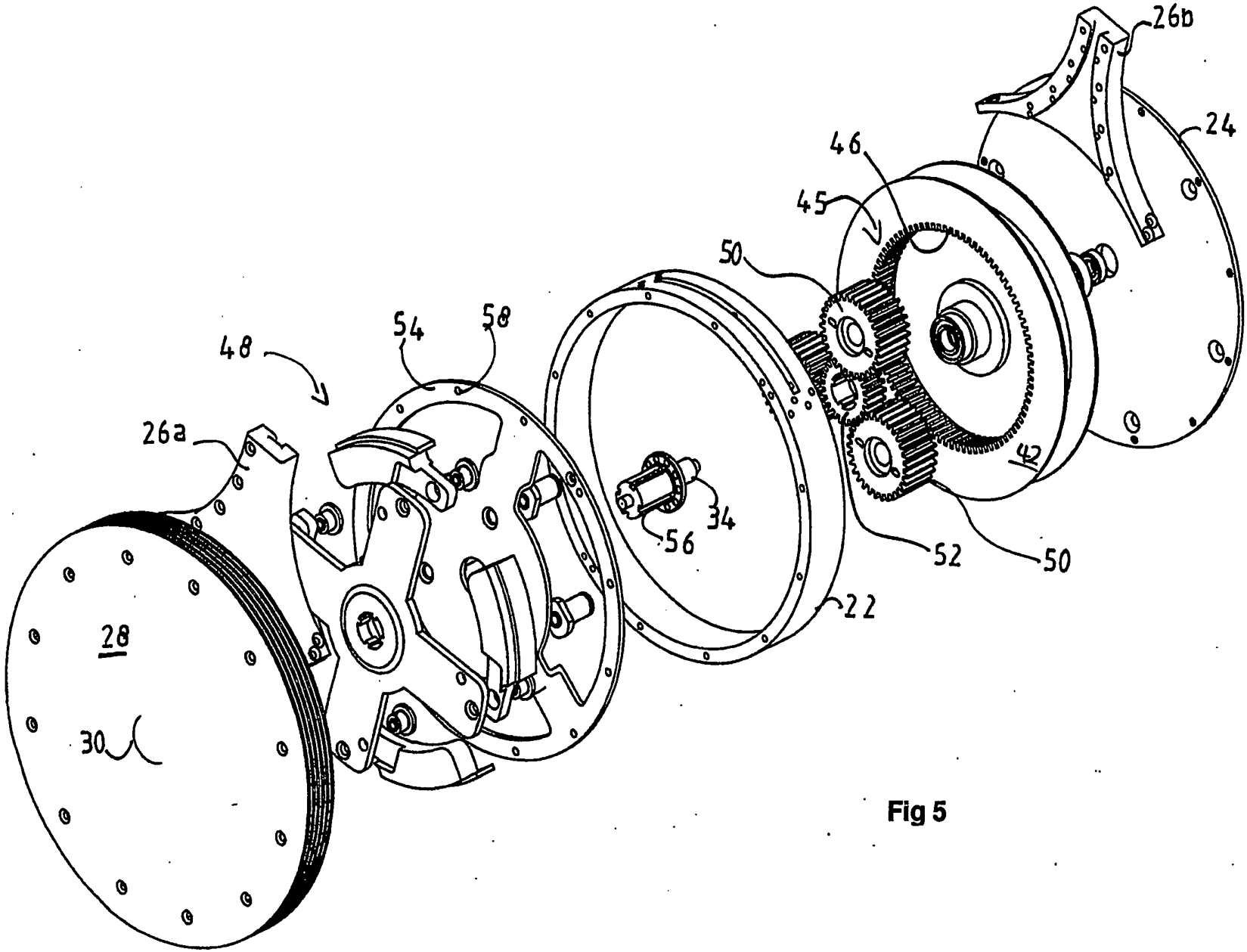


Fig 5

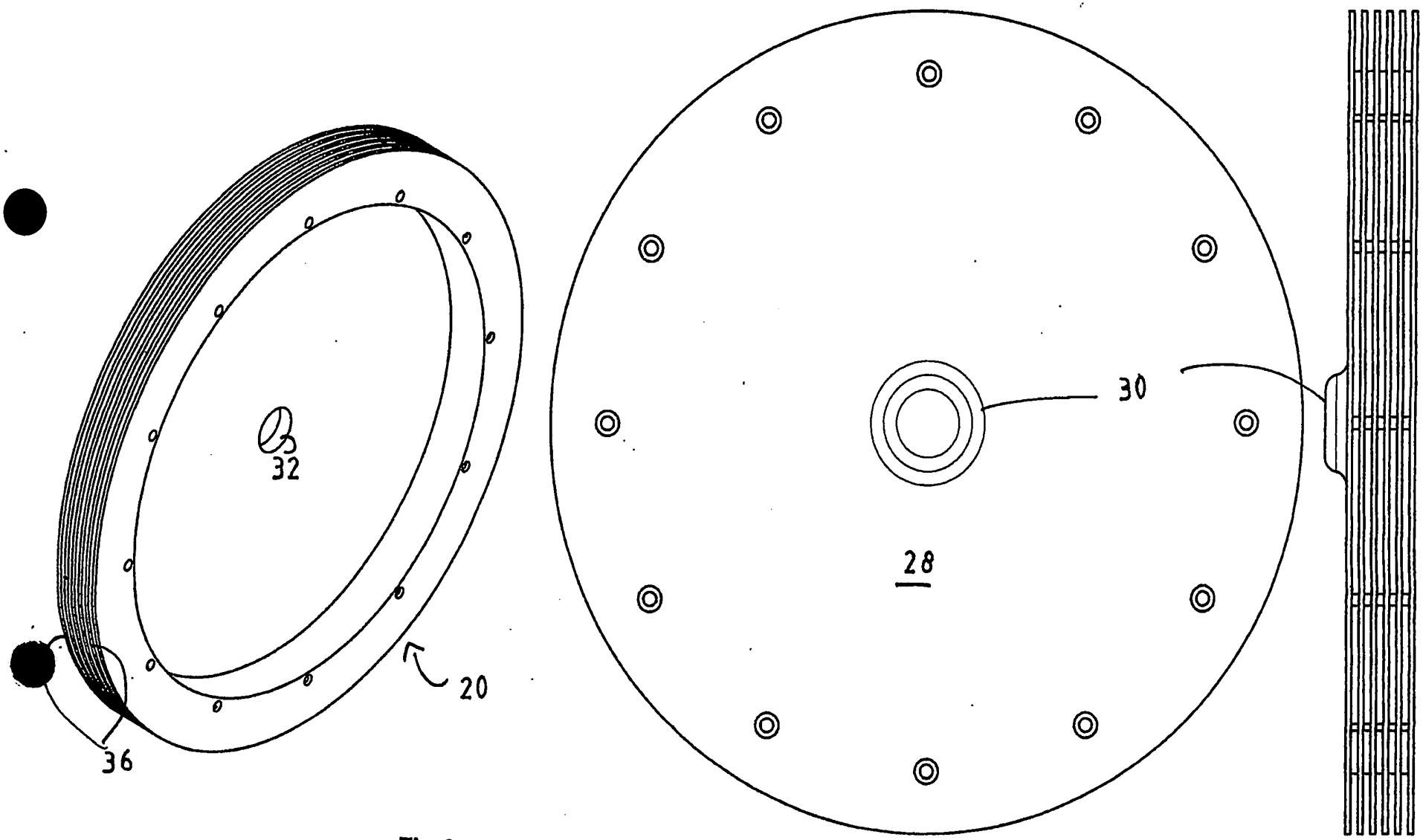


Fig 6

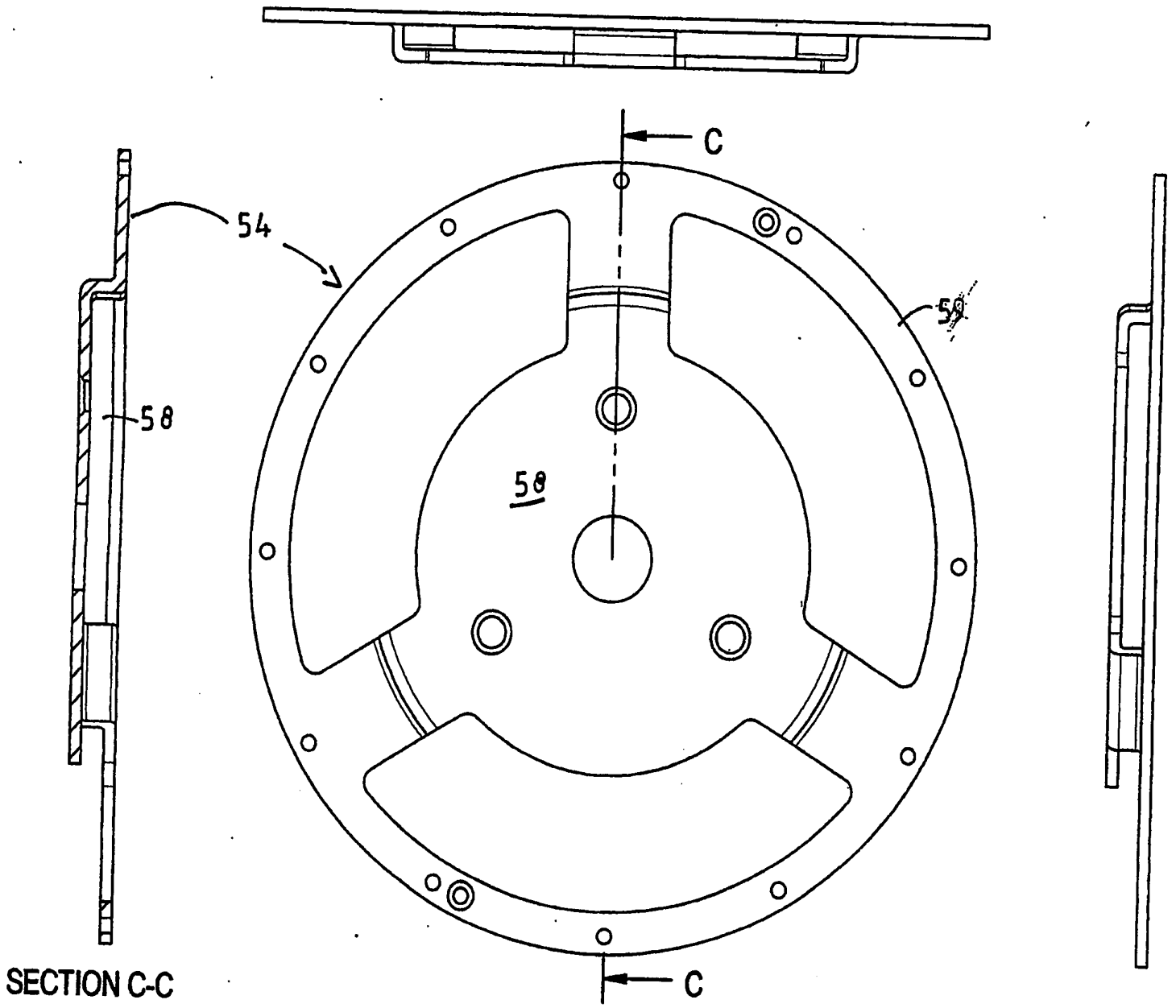


Fig 7

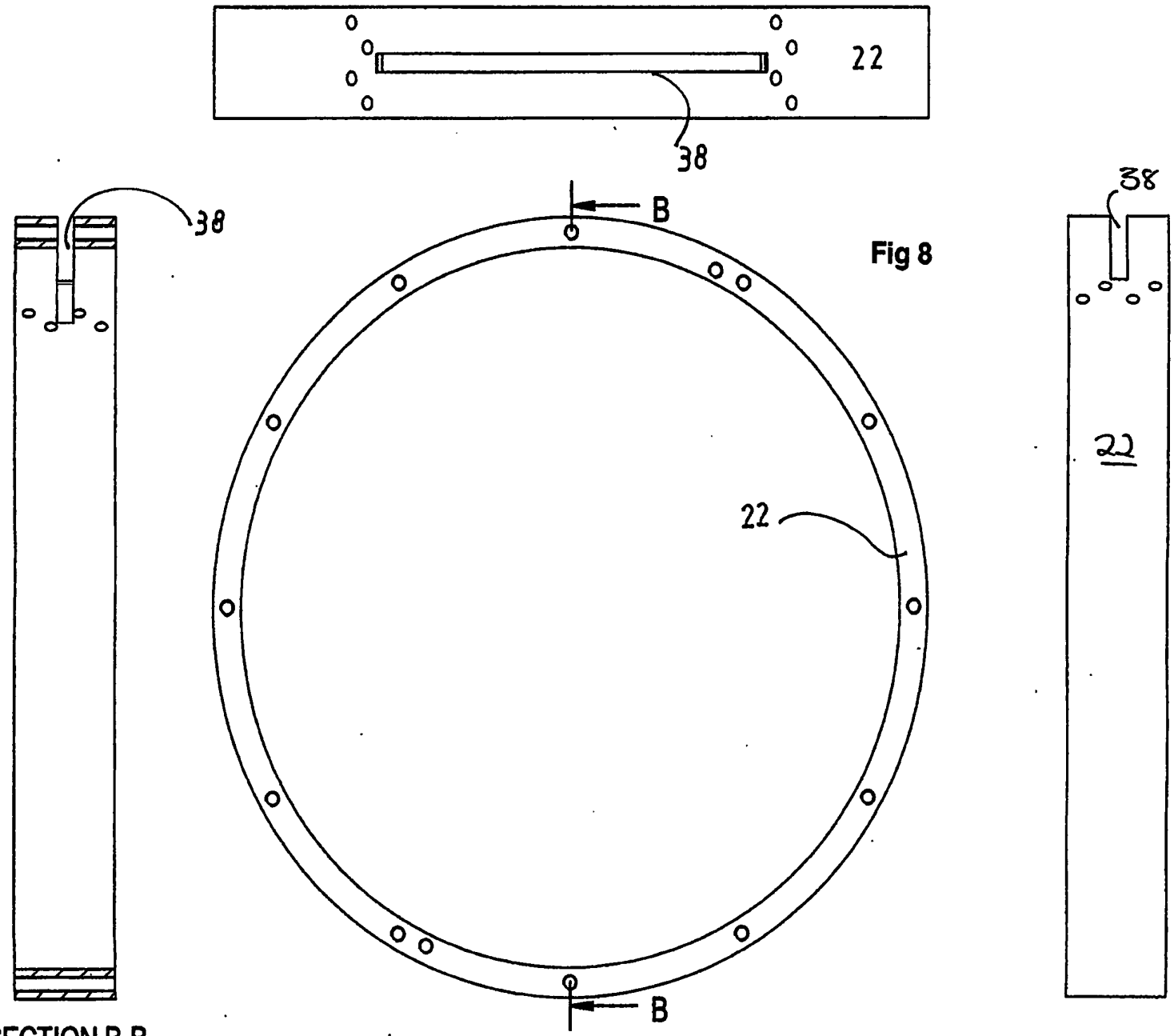
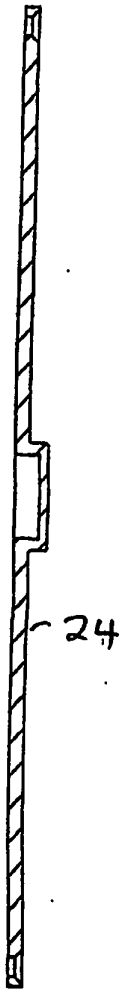
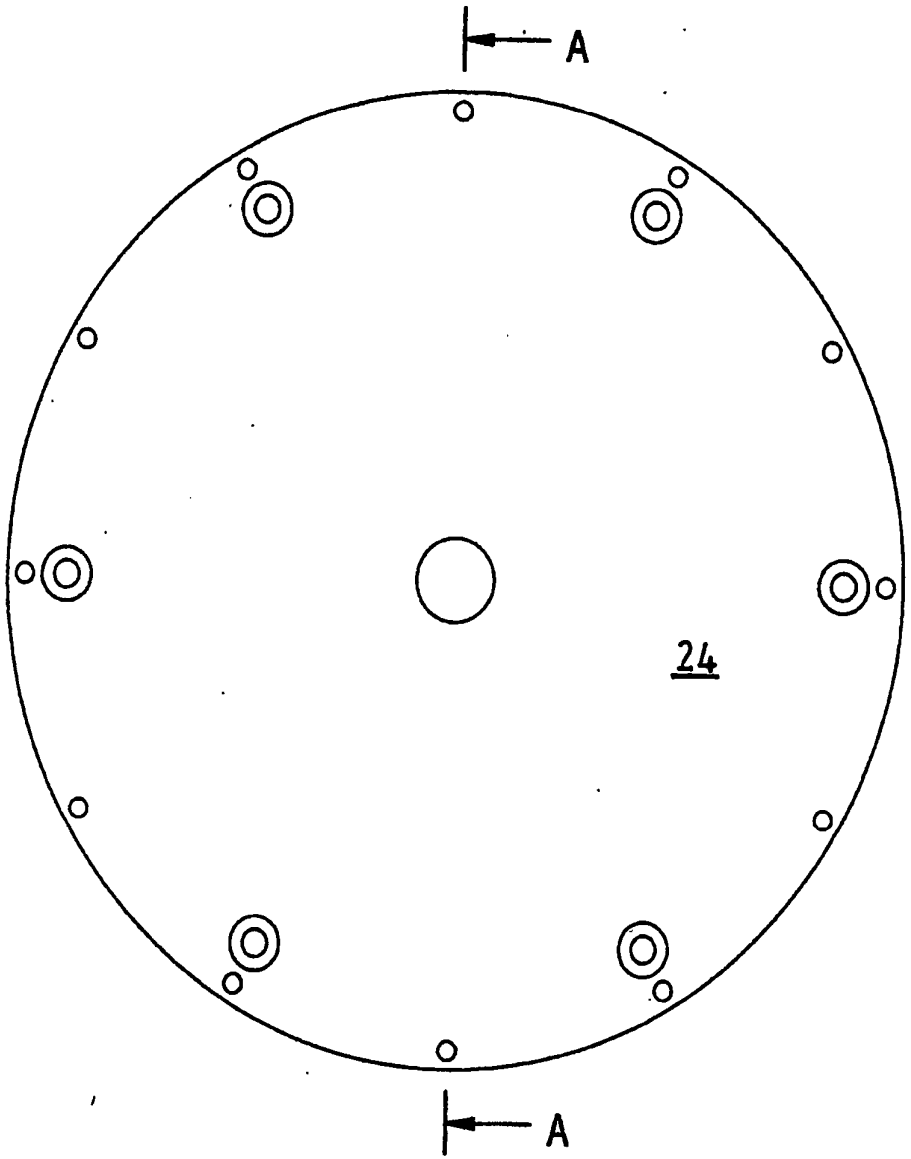


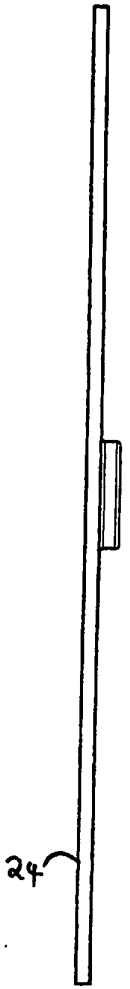
Fig 8

Fig. 9



SECTION A-A





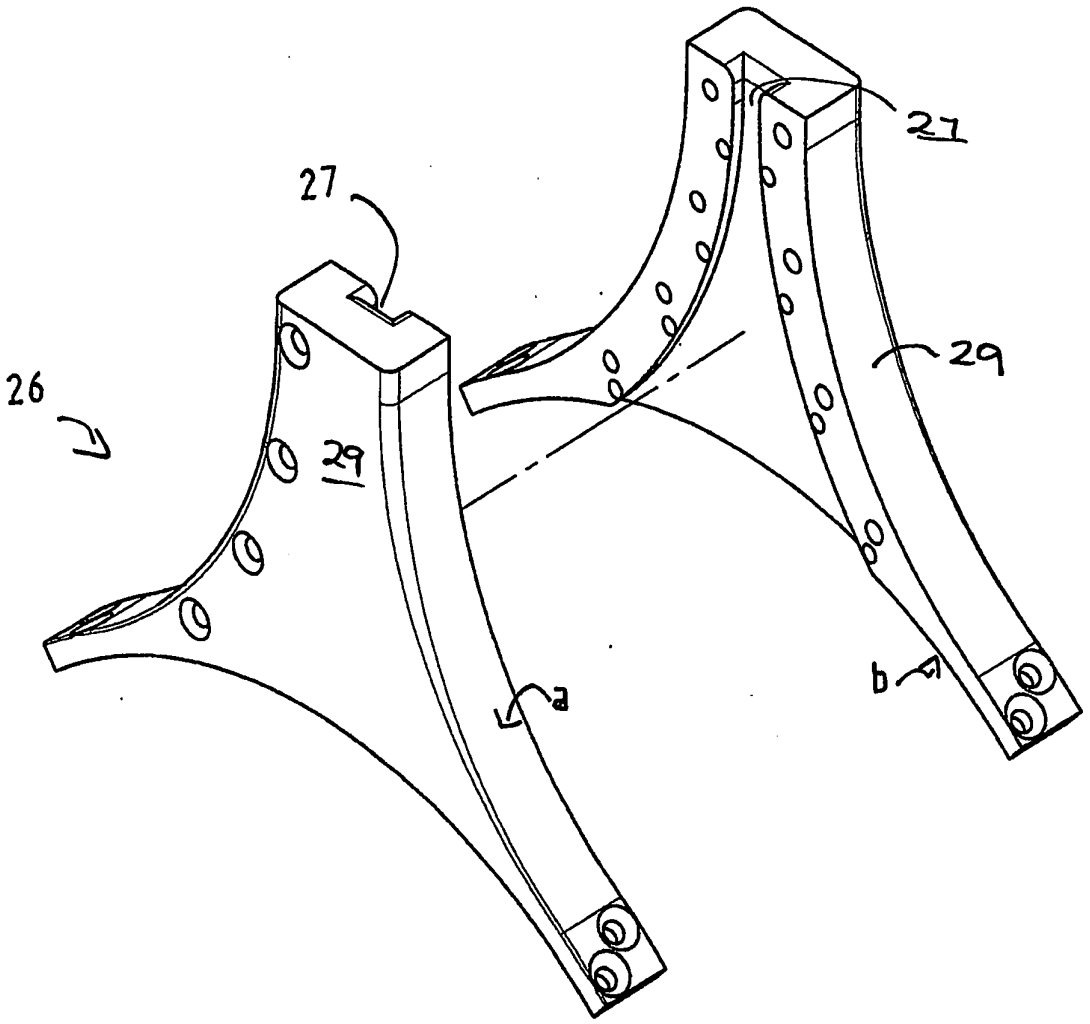
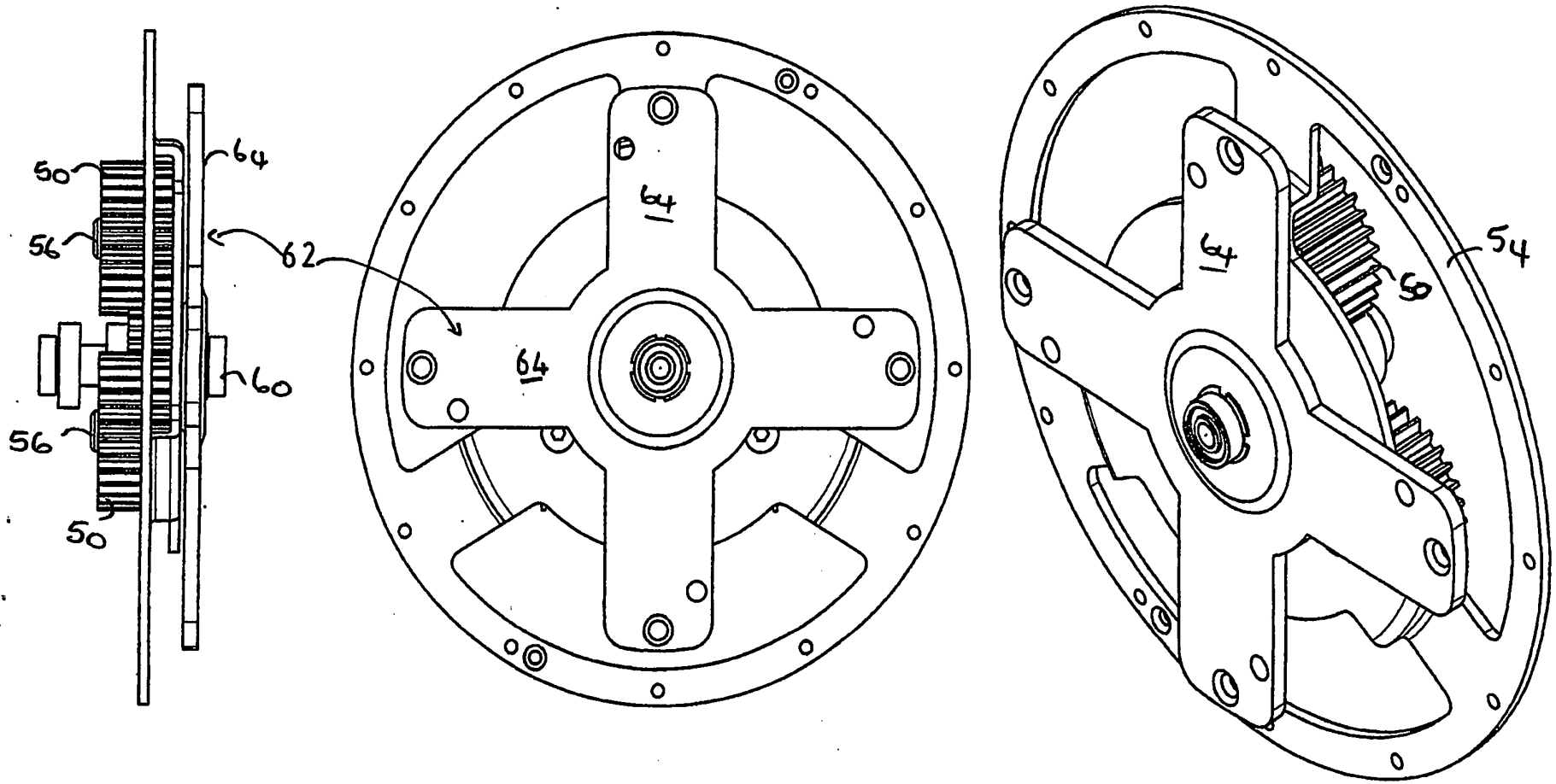


Fig 10

Fig 11



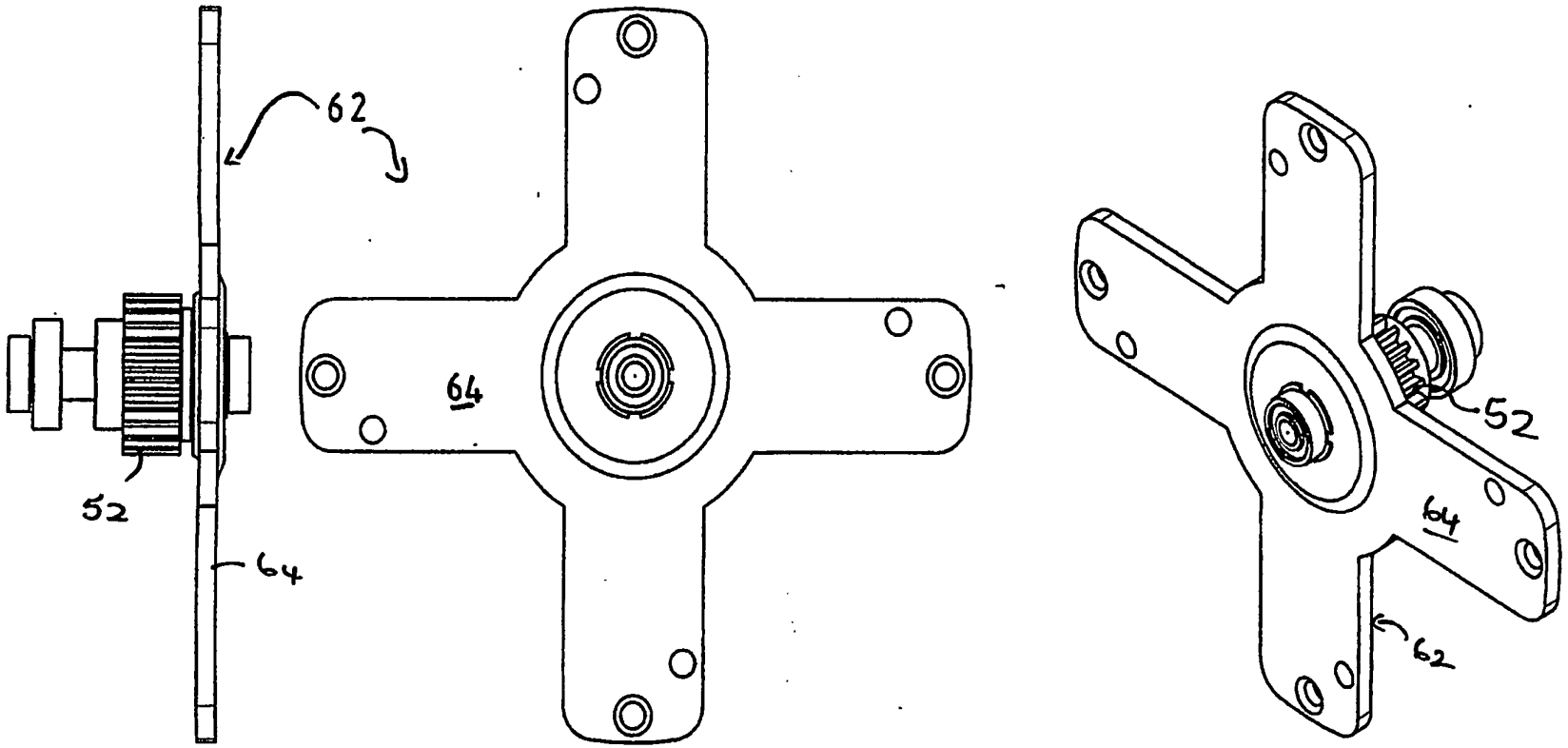


Fig 12

Fig 13

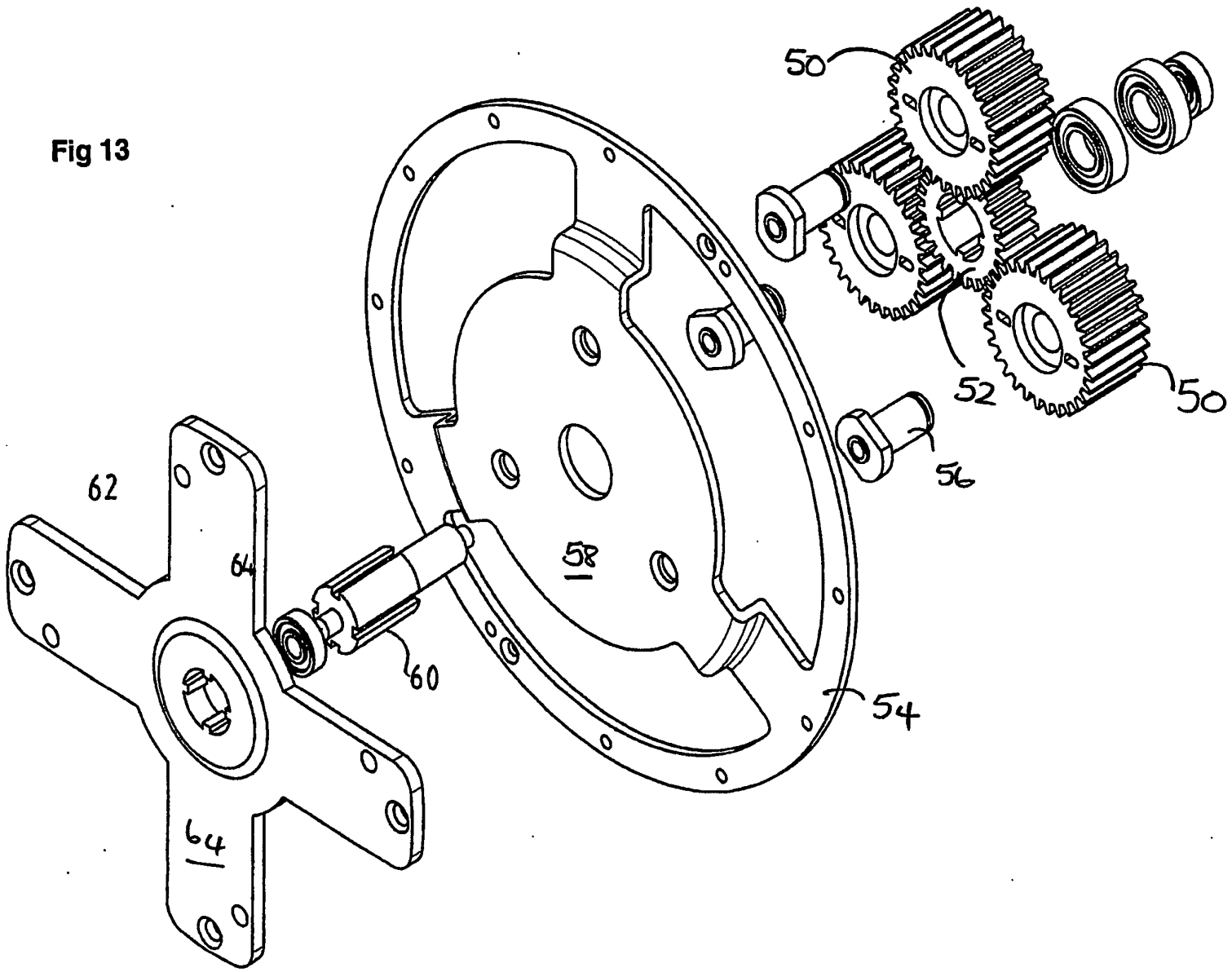
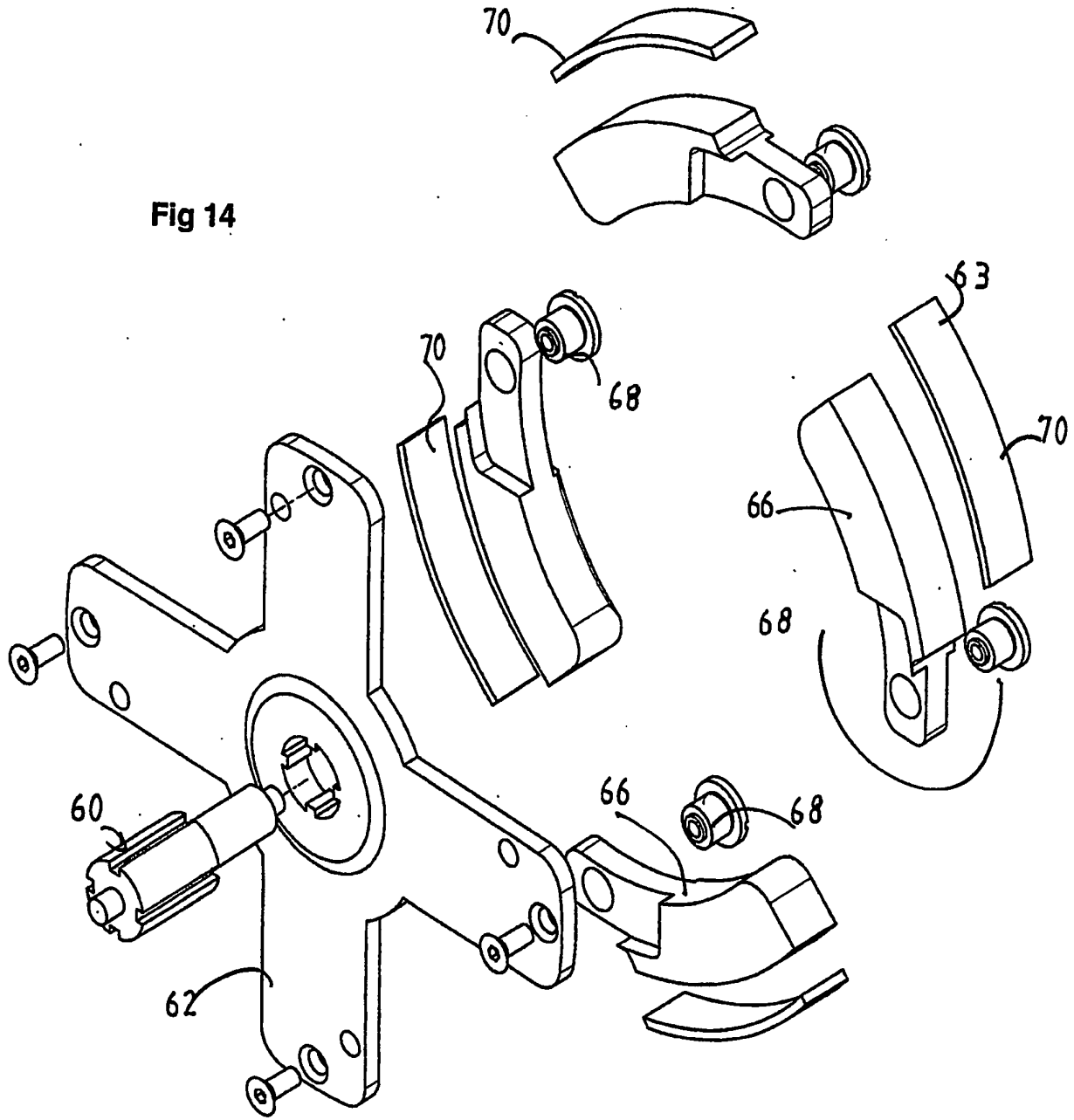
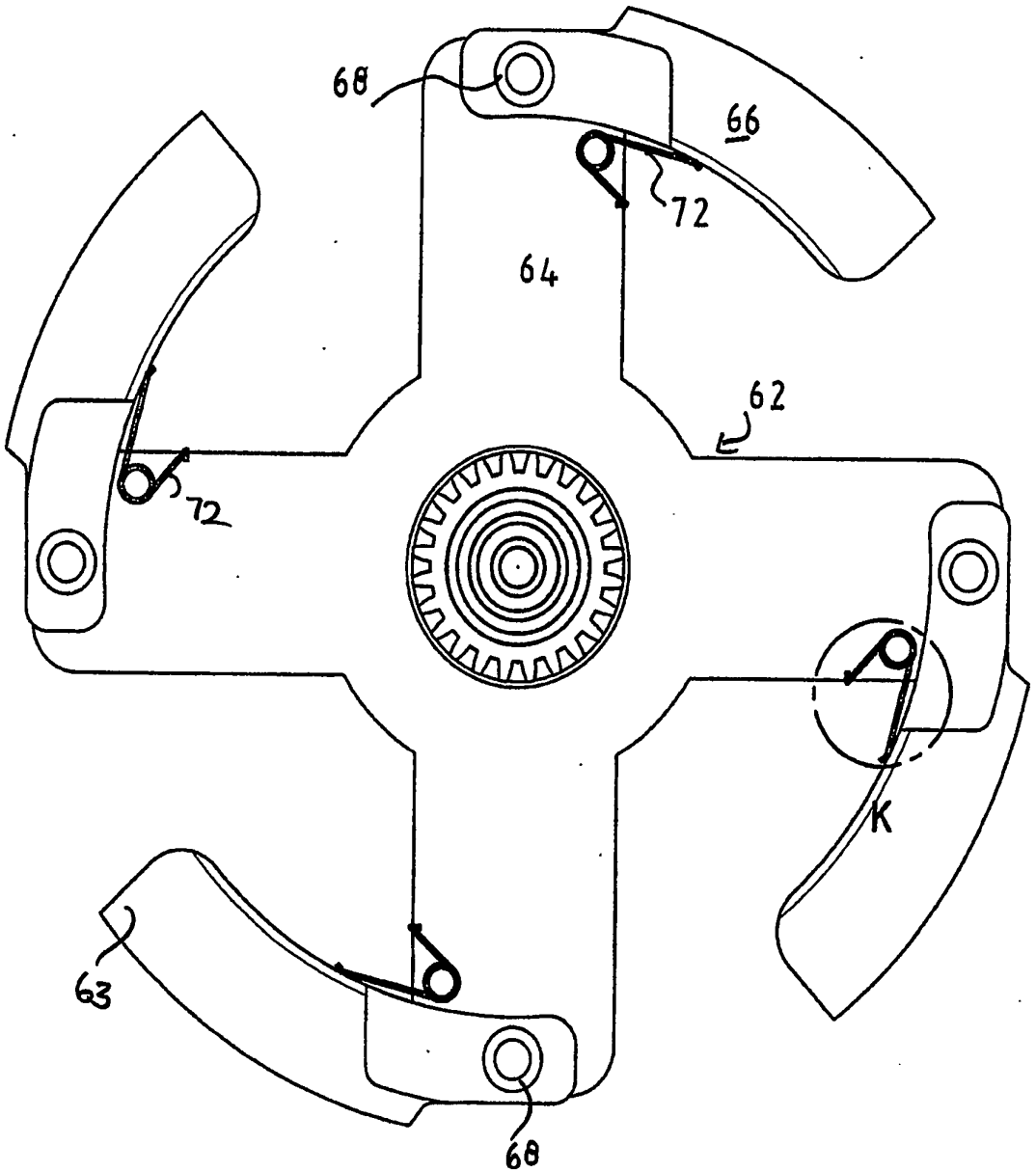
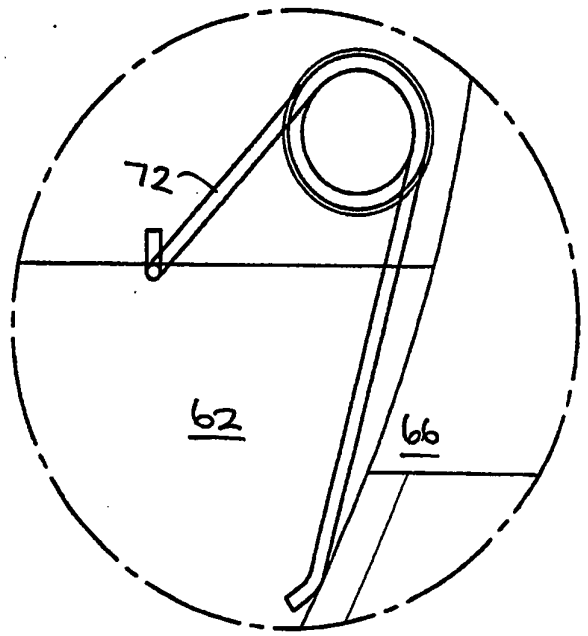


Fig 14







DETAIL K

Fig 15

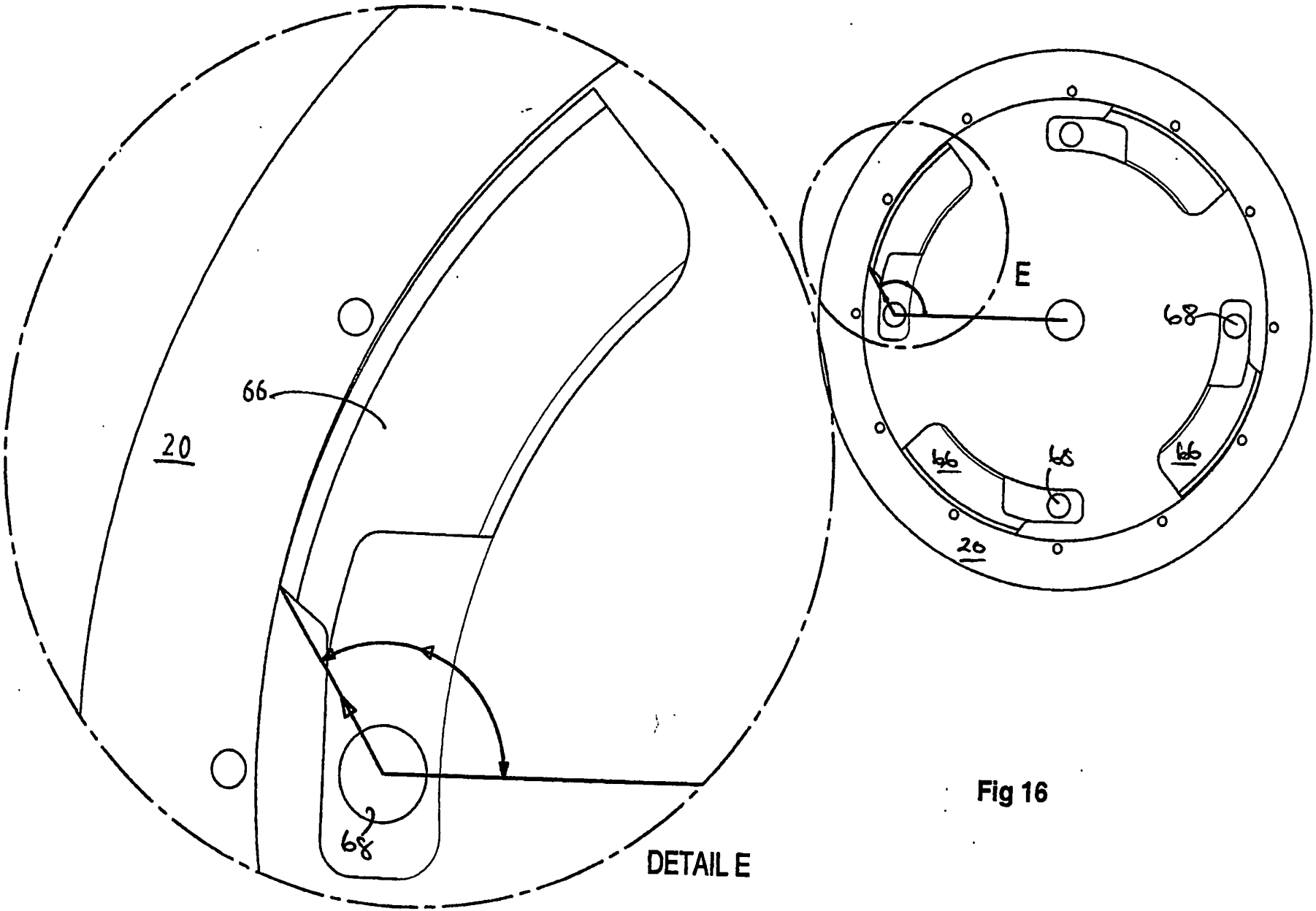
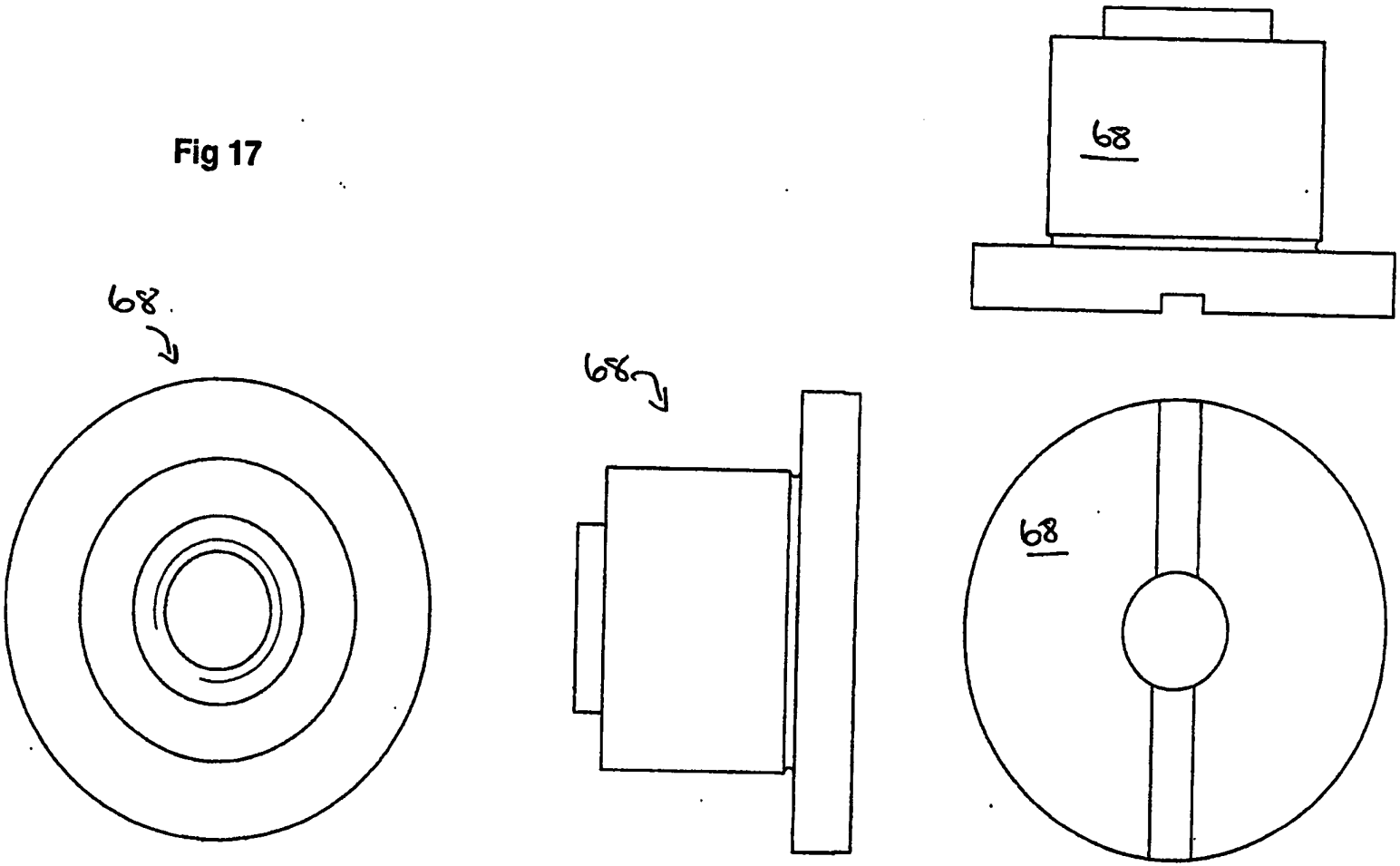
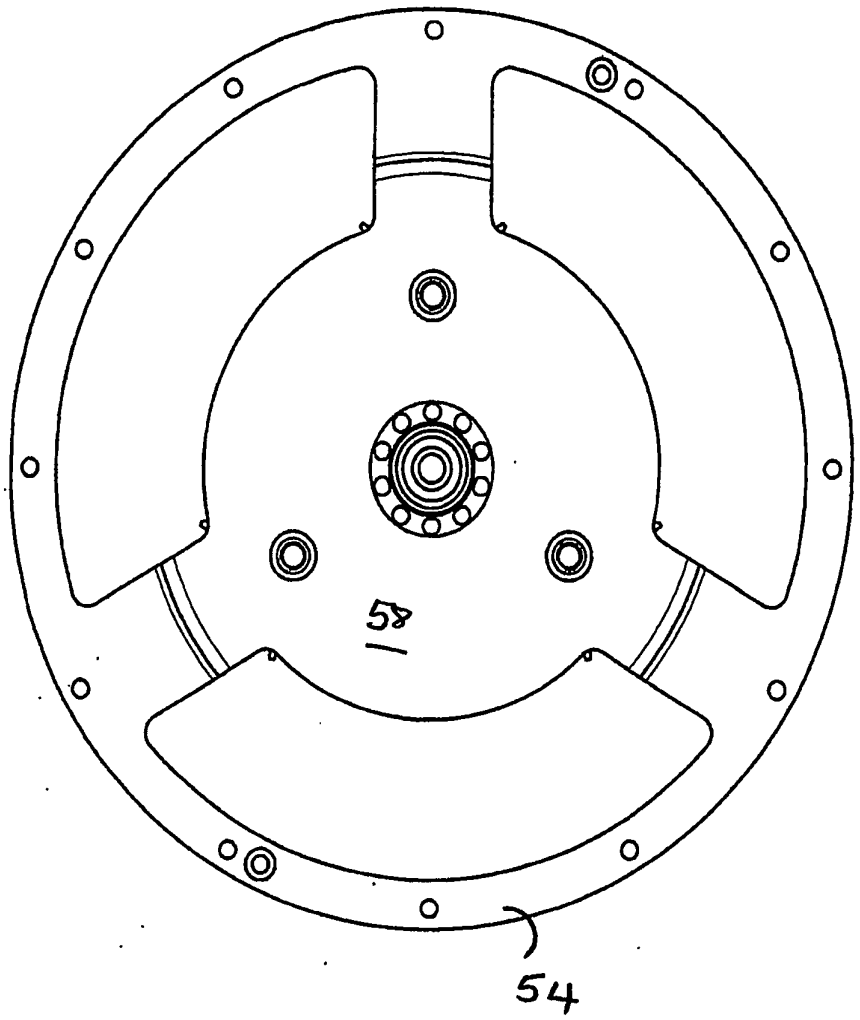


Fig 16

Fig 17





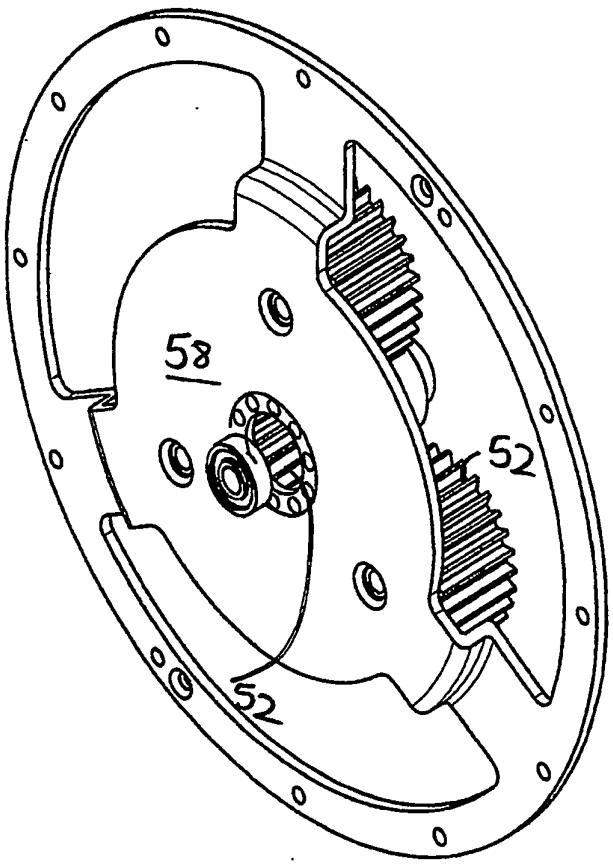


Fig 18

Fig 19

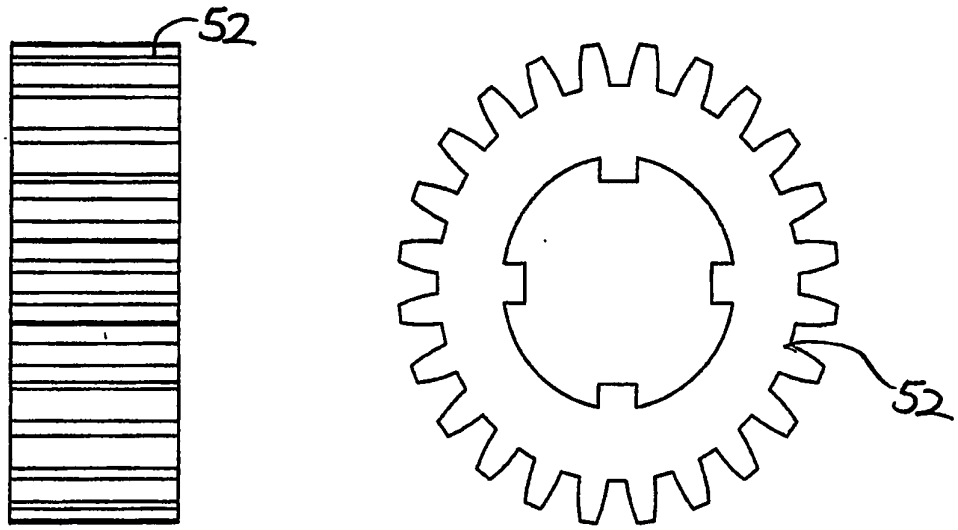


Fig 20

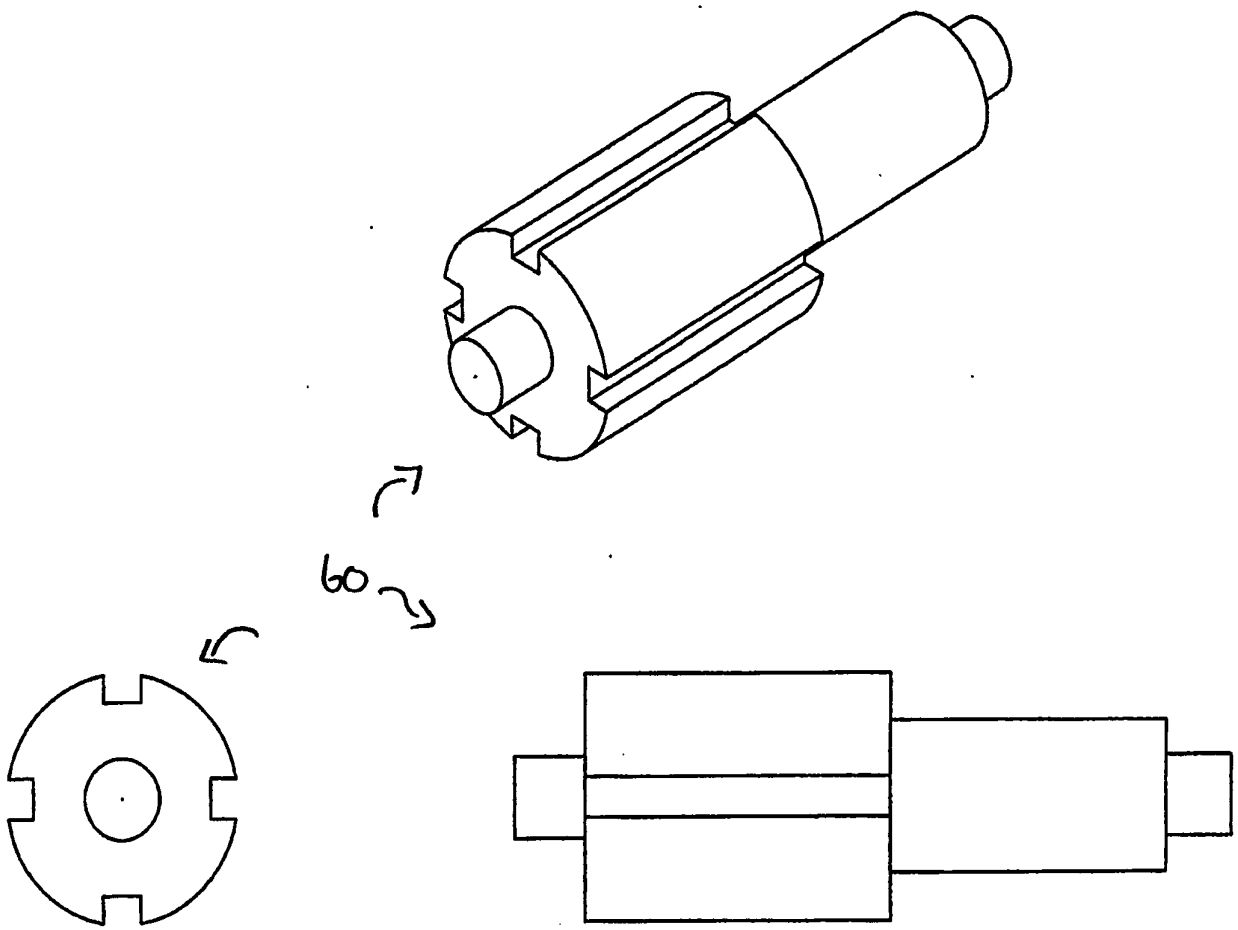
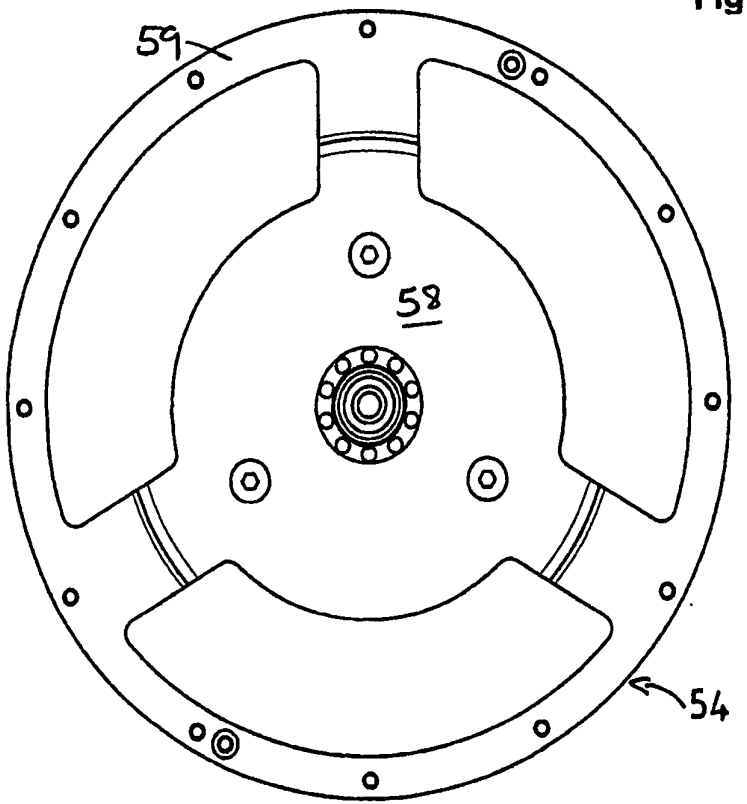


Fig 21



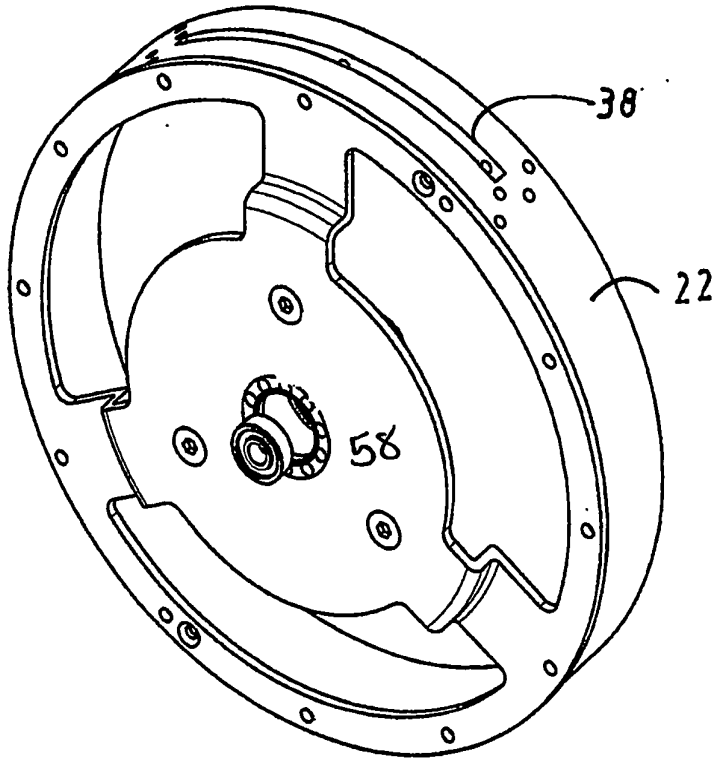
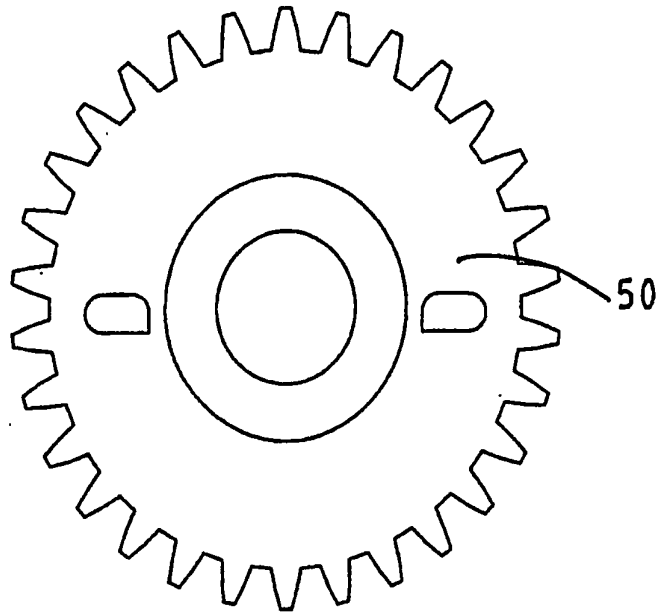
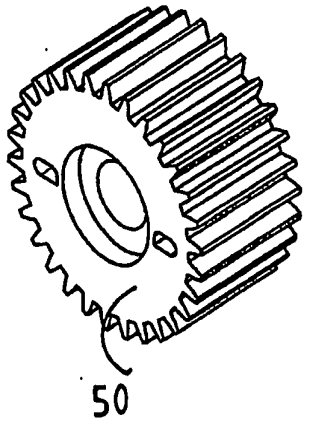


Fig 22





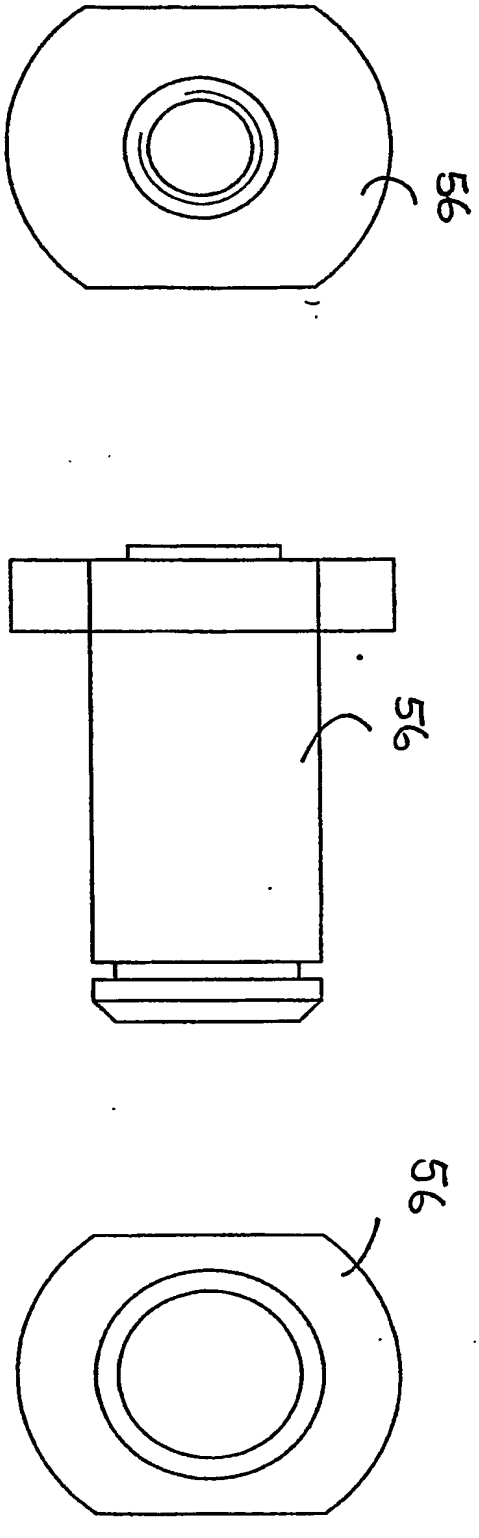
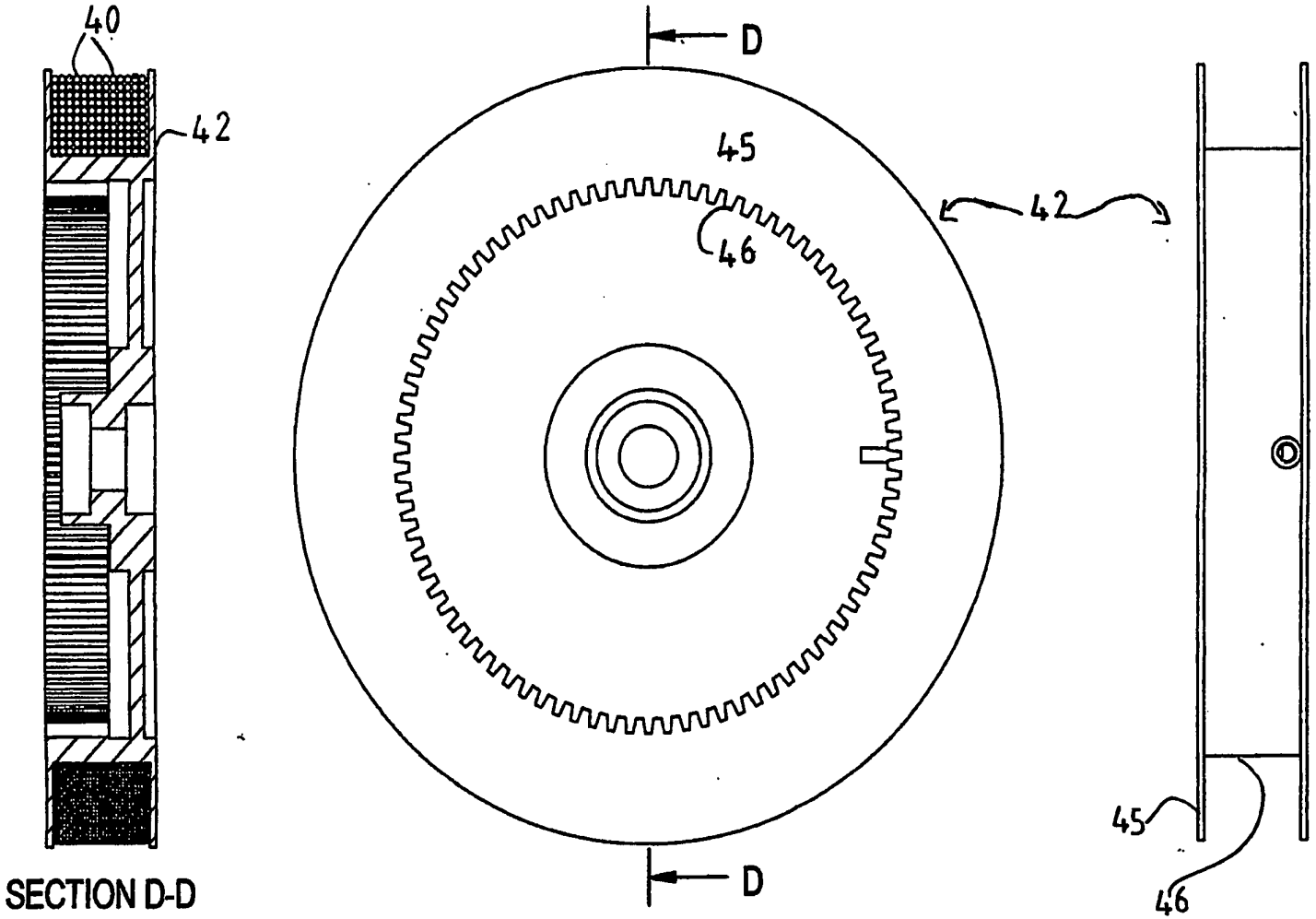


Fig 23

Fig 24



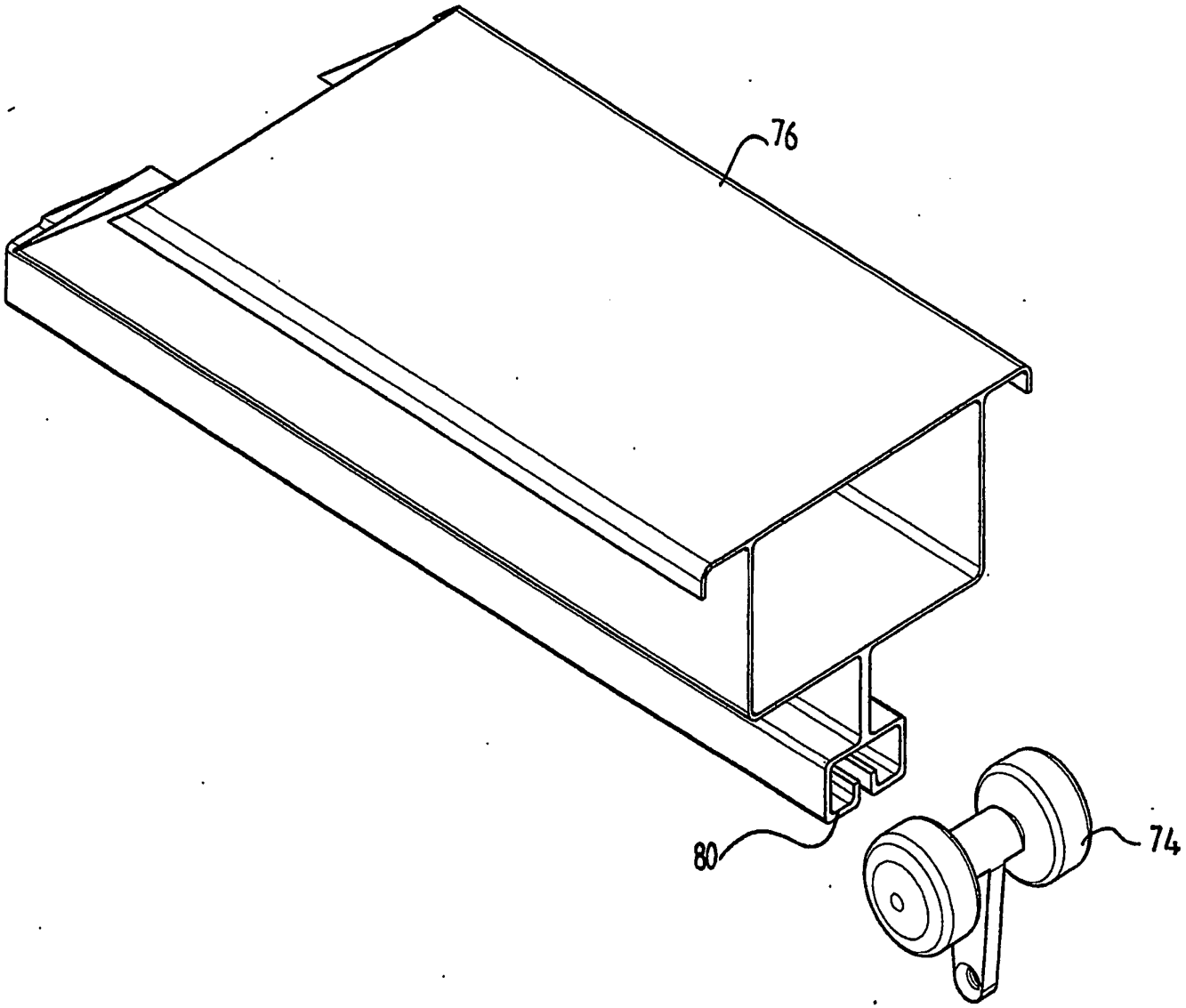


Fig 25

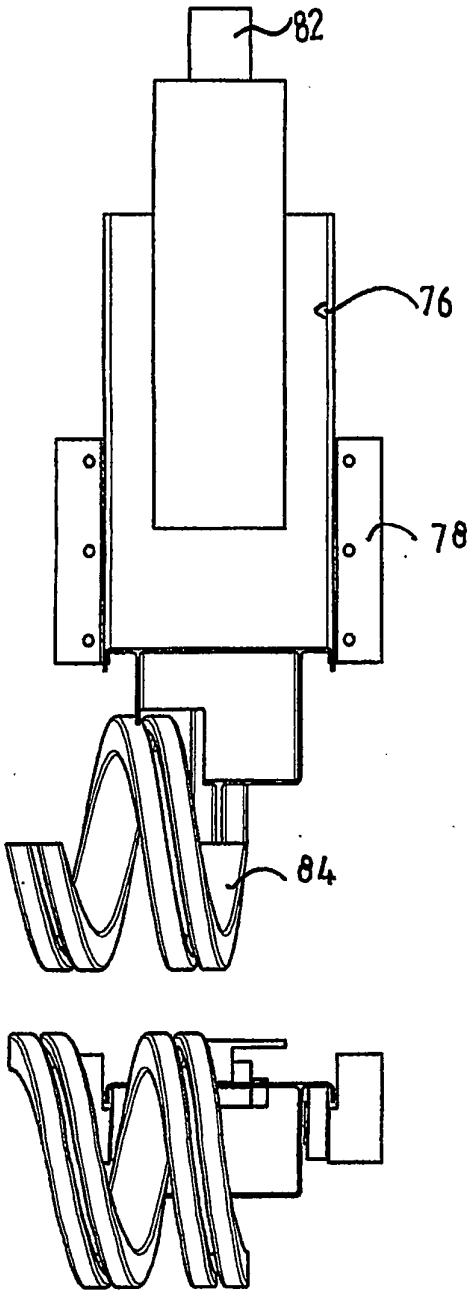
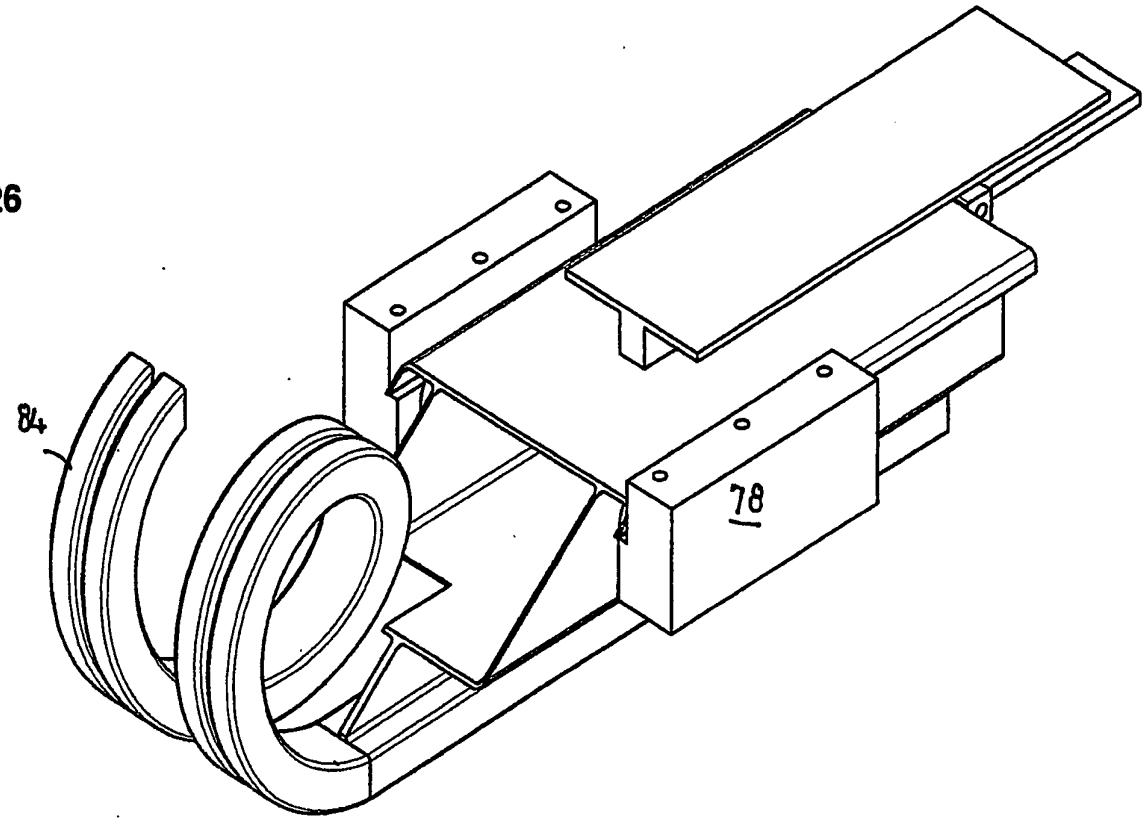
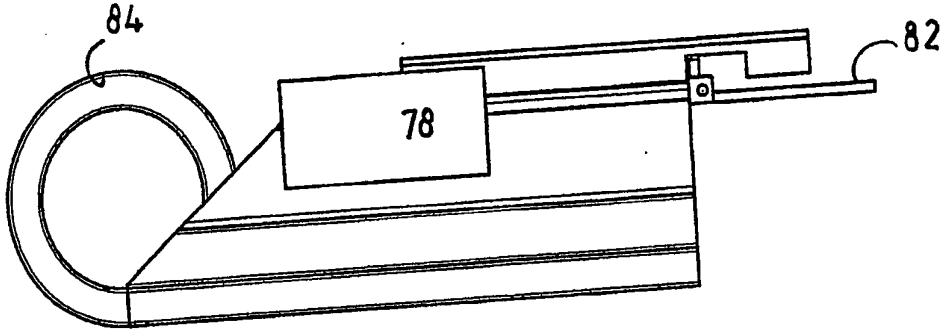


Fig 26





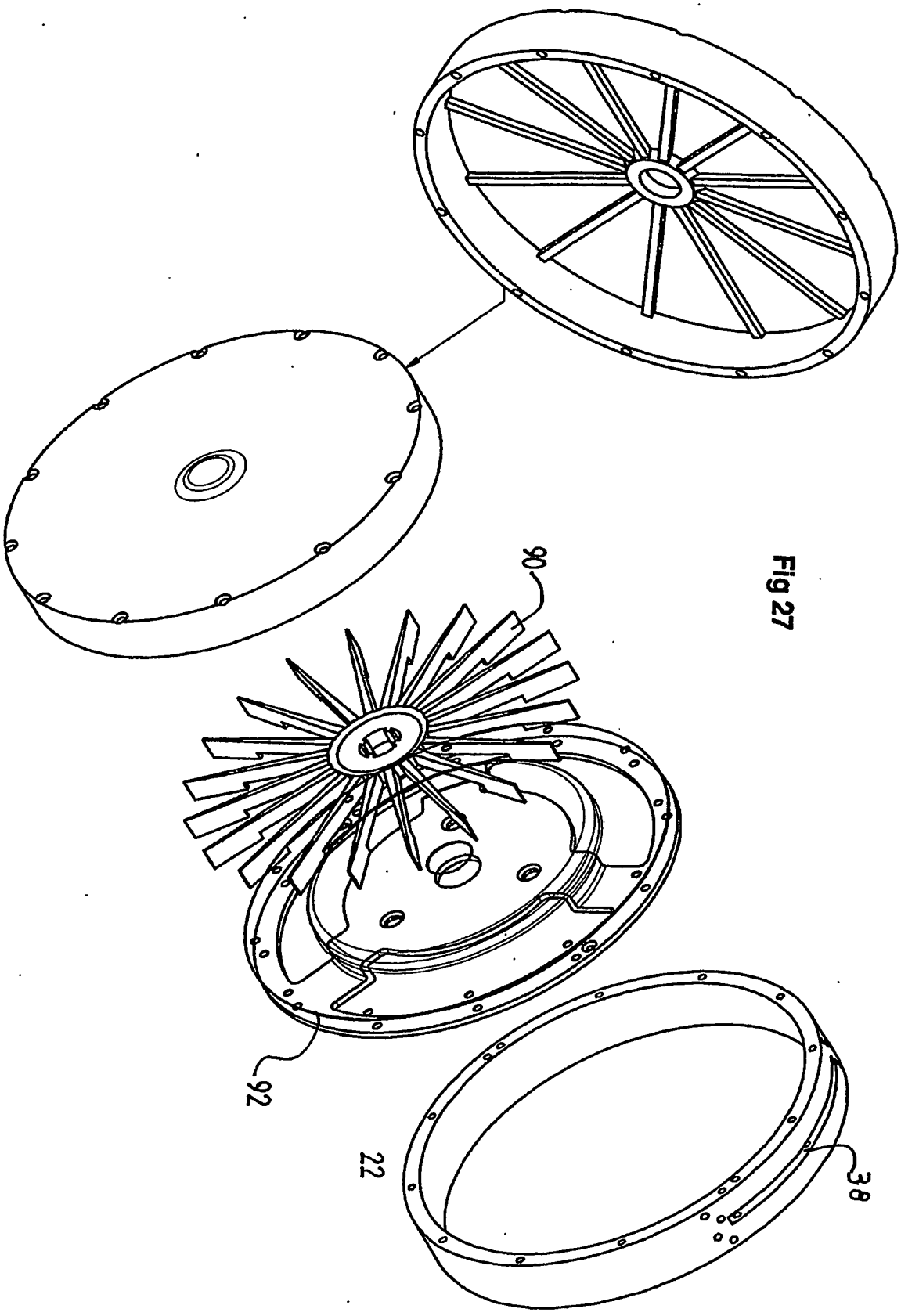


Fig 27